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Turn-of-the-month and Intramonth Anomalies and U.S. Macroeconomic News Announcements on the Thinly Traded Finnish Stock Market

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Abstract

Evidence from the U.S. stock market as well as from major European stock markets has lately suggested that the turn-of-the-month (hereafter TOM) and intramonth anomalies occur because of major U.S. macroeconomic news announcements that are released around the TOM. World-wide markets are becoming more integrated and therefore in this study we hypothesize that major U.S. macroeconomic news announcements are also the cause for the TOM and intramonth effects on the thinly traded Finnish market. This study uses Finnish data to first identify significant TOM and intramonth effects and second to investigate whether these anomalies arise because of the clustered major U.S. macroeconomic news announcements. Both so-called calendar anomalies are evident, but after controlling for the effect of the major U.S. news releases the anomalies disappear, resulting in further evidence for the significance of the clustered U.S. macroeconomic news announcements. The results of this study are in line with earlier findings and claim that the TOM and intramonth anomalies are driven by the clustered release of major U.S. macroeconomic news announcements.

Keywords: Turn-of-the-month, Intramonth, Clustered releases, Macroeconomic news announcements

1. Introduction

The turn-of-the-month (TOM hereafter) and intramonth anomalies have aroused the interest of numerous researchers (see e.g. Ariel, 1987; Lakonishok & Smidt, 1988; Pettengill & Jordan, 1988; Kunkel, Compton & Beyer, 2003; McGuinness, 2006). The results of these studies show that stock market returns are significantly higher around the TOM and positive (negative) in the first (second) half of the month (see e.g. Ariel, 1987; Lakonishok & Smidt, 1988; Cadsby & Ratner, 1992). These studies report abnormally high returns especially on a few days around the turn-of-the-month (days -1 to +4). For example, Kunkel, Compton and Beyer (2003) examine 19 different stock markets. In 15 countries where the TOM effect is found, it accounts for 87 percent of the monthly returns on average. The research on the TOM and intramonth anomalies has gone on for decades, but has been more broad than profound in nature. Surprisingly, only a few studies have raised the question of the reasons for these anomalies. Potential explanations evinced as the causes for these anomalies includ the periodic flow of funds into the market and the standardization in the payment system (see e.g. Pettengil & Jordan, 1988; Ogden, 1990). In this study we analyze the recurrence of major U.S macroeconomic news announcements as the reason for the TOM and intramonth anomaly on the Finnish stock market.

While the TOM and intramonth anomalies have been extensively studied, macroeconomic news announcements as the reason for these anomalies have received relatively little attention. It has been documented that some macroeconomic news announcements have greater influence on stock markets than others (see e.g. Bollerslev et al., 2000; Nikkinen & Sahlström, 2001; Graham, Nikkinen & Sahlström 2003) such being, for example, the employment report, the producer price index, the employment cost index, retail sales and the ISM (Institute of Supply Management; manufacturing and

non-manufacturing) survey. (Note 1) The most important announcements are also systematically released at the beginning of the month (Gerlach, 2007; Nikkinen, Sahlström and Äijö, 2007a; 2007b).

Three recent studies deal directly with these issues. Gerlach (2007) and Nikkinen et al. (2007a) study the effects of major U.S. macroeconomic news announcements on the TOM and intramonth anomalies on the U.S. stock market. The results from both papers provide evidence supporting the macroeconomic news announcement hypothesis, i.e. that important U.S. macroeconomic news announcements released in a clustered pattern can be deemed the major reasons for the TOM and intramonth anomalies. The third study, Nikkinen et al. (2007b), study the same issues but on different markets. The study investigates the effect of U.S. macroeconomic news announcements on three major European stock indices. Significant TOM and intramonth effects are found on the DAX, FTSE-100 and CAC indices. Both anomalies disappear after taking the effect of the news announcements into account, meaning that the macroeconomic news announcements are the reason for both anomalies.

The objective of the study is to examine whether the release of clustered U.S. macroeconomic news announcements explain the TOM and intramonth effects on the thinly traded Finnish stock market. This study is motivated by the earlier literature on the integration of financial markets (see e.g. Christie-David, Chaudhry & Khan, 2002; Nikkinen, Omran, Sahlström & Äijö, 2006) and by studies on the impacts of U.S. macroeconomic news announcements on European stock markets (see e.g. Nikkinen et al., 2006; Nikkinen et al., 2007b). According to Nikkinen and Sahlström (2004) U.S. macroeconomic news announcements have been found to have a greater effect on European stock markets than comparable domestic announcements. In light of on earlier literature (see e.g. Martikainen, Perttunen & Puttonen, 1995; Nikkinen et al., 2007b) we hypothesize that TOM and intramonth effects can be found on the Finnish stock market and that the TOM and intramonth anomalies are driven by the release of major U.S. macroeconomic news announcements.

We begin our analysis by investigating whether the TOM effect and related intramonth effect still exist on the Finnish stock market. While Martikainen et al. (1995) document significant TOM effects on the Finnish stock index futures, options, and cash markets, our study moreover investigates whether these anomalies can be explained by the clustered U.S. macroeconomic news announcements. The Finnish stock market is an example of a small, but developed, stock market with relatively low trading volume. The Finnish economy and Finnish firms are heavily dependent on the demand from other countries, which is typical for a smaller European country. For example, in 2005 exports constituted almost 40% of gross domestic product (GDP). As a comparison, the U.S. export was about 10% of GDP in 2005. Furthermore, the proportion of foreign ownership in Finland is quite large as, for example, it was approximately 50% of the listed stocks in 2006. Therefore, foreign investors have a large role on the Finnish stock market. Because of these characteristics, the Finnish market provides a stark, international contrast to earlier studies done in this field. This study extends the work of Gerlach (2007) and Nikkinen et al. (2007b) by using such a small and specific market as the subject of investigation that the results will contribute additional information to the field of study.

The results of this study are in line with those of earlier studies and further support the macroeconomic news announcement hypothesis. The Finnish market index OMXH25 shows a significant TOM effect on days +1 and +2 with respect to the TOM. An intramonth effect is also found on the Finnish stock market. The results for the intramonth effects are not sensitive to the methodology according to which the month is divided, i.e. the results do not change whether the month is splitt into two halves as in Ariel (1987) or into thirds as in Nikkinen et al. (2007b). After controlling for the effect of macroeconomic news announcements the TOM and intramonth effects are shown to exist no longer, which supports the macroeconomic news announcement hypothesis in a thinly traded stock market.

The structure of the remainder of the study is as follows. The following section describes the hypothesis development and is followed by a section introducing the data used. Section 4 describes the methodology of the study. The empirical results are discussed in Section 5 and the final section concludes and summarizes the findings.

2. Hypothesis development

Following Nikkinen et al. (2007a) the hypotheses of this study are based on the following arguments. The reasoning will establish the basis for the macroeconomic news announcements hypothesis. Macroeconomic news announcements are scheduled and well known to investors in advance. They contain pertinent information on the values of financial assets, and therefore affect the valuation of these assets and can be considered as risk factors (see e.g. Ederington et al., 1993; Jones, Lamont & Lumsdaine, 1998; Fleming & Remolona, 1999; Christie-David, Chaudhry & Koch, 2000).

The second argument states that important macroeconomic news announcements are released on certain days of the month and therefore follow a predictable pattern. The majority of these macroeconomic news announcements are clustered in the first half of the month (see e.g. Bollerslev et al., 2000; Graham et al., 2003). Earlier studies also demonstrate that the macroeconomic news announcements issued at the very beginning of the month are of the greatest importance due to their significant information value.

In creating a reliable base for the hypothesis of the study the last consideration is that trading activities increase around the macroeconomic news announcements when traders bid according to their assessments of the content of the announcements (see e.g. Fleming et al. 1999; Chordia & Subrahmanyam 2001; Nofsiner & Prucyk 2003) which increases liquidity. The increase in liquidity is positively related to price changes and, as Karpoff (1987) has shown, this link mainly results from information arrival with a surge in trading volume at the TOM (see e.g. Booth, Kallunki & Martikainen 2001).

For two main reasons, we hypothesize that U.S. macroeconomic news releases could also be the cause for the TOM and intramonth anomalies on a small European stock market. First, the empirical evidence shows that the European stock markets are affected by the U.S. macroeconomic news releases, and it is the U.S. announcements in particular which have a greater effect on European stock markets than domestic macroeconomic news announcements (see e.g., Nikkinen and Sahlström, 2004; Nikkinen et al., 2006). Second, the European stock markets are highly integrated with the U.S. stock markets. Realized returns and variances are highly correlated on these markets and, most importantly, the U.S. market seems to be the leading source of information (see e.g., Lin et al., 1994; Susmel and Engle, 1994; Bekaert and Harvey 1995; Booth et al., 1997). Thus, it can be hypothesized that the TOM and intramonth anomalies observed on a small European stock market occur due to important U.S. macroeconomic news releases.

3. Data

The Finnish market data is taken from the NASDAQ OMX Helsinki 25 index. It is the Helsinki Stock Exchange leading share index and consists of the 25 most traded series on the Helsinki Stock Exchange's Main List. Given the special features of the relatively small Finnish stock market the OMXH25 is a modified-capitalization weighted index where no company's weight is greater than 10 percent. This proves to be important, especially in the case of the world leader in mobile phones, Nokia Corporation. The dataset used in this study covers the period from 1 January 2001 to 28 December 2007. The research data includes exactly 1, 760 trading days on the Finnish market.

The sample of scheduled macroeconomic news releases investigated is largely based on the literature (see e.g. Bollerslev et al., 2000; Graham et al., 2003; Nikkinen et al., 2007b) and on the Bureau of Labor Statistics (BLS) classifications of major economic indicators. Thus, they are selected because of their anticipated importance. This sample consists of the U.S. macroeconomic news releases covering the period between January 2001 and December 2007.

The majority of U.S. announcements are released in the morning at 8:30 a.m. Eastern Time (ET), which corresponds to 3:30 p.m. Finnish time (GMT +2 h). At the time of the majority of the announcements the U.S. stock market is not open, except for the reports on manufacturing and non-manufacturing of the Institute for Supply Management (ISM), which are released at 10:00 a.m. The Finnish market, however, is open from 10:00 a.m. to 6:30 p.m. local time and has several hours of trading time left when the announcements are released. Since releases are made during the trading hours of the Finnish market, the impact of the releases is incorporated into the closing prices of the Finnish market. The average dates of the announcements, the announcement period and the number of announcements contained in the sample are presented in Table 1. Certain announcements are made consistently on a given day each month, which can be seen in the statistics. For example, the Employment Report is released on the first Friday of the month and the Manufacturing ISM and non-manufacturing ISM reports respectively on the first and third trading days of the month.

(Insert Table 1 about here.)

4. Methodology

The daily return R_t has been calculated from the following equation:

$$R_t = \ln\left(\frac{OMXH25_t}{OMXH25_{t-1}}\right) \tag{1}$$

where $OMXH_t$ is the closing value of the index on day t. To investigate whether the Finnish market exhibits any turn-of-the-month effect we follow the models used in the literature (see e.g. Szakmary & Kiefer 2004; Nikkinen et al. 2007a; Nikkinen et al. 2007b). Therefore, the following regression model is estimated:

$$r_t = \sum_{i=-9}^{9} \alpha_i D_{i,t} + \alpha_0 ROM_t + \varepsilon_t \tag{2}$$

where r_t is the stock market return at time *t, i* refers to the days around the TOM (-9, -8, …, +8, +9), $D_{i,t}$ stands for the dummy variable taking a value of 1 on day *i,* otherwise zero, ROM_t is also a dummy variable that takes a value of 1 on the days that fall within the days outside the TOM days (i.e. other than -9, -8, …, +8, +9), otherwise zero.

To find out whether the Finnish market exhibits an intramonth effect we follow the approach used by Ariel (1987) and divide the month into two halves. Furthermore, we divide the month into three parts compared to Ariel's two. This will

give us a more detailed view of the phenomenon. The model used by Ariel and the regression derived from Ariel's initial model are as follows:

$$r_t = \alpha_1 FH_t + \alpha_2 SH_t + \varepsilon_t \tag{3}$$

$$r_t = \alpha_1 FT_t + \alpha_2 ST_t + \alpha_3 LT_t + \varepsilon_t \tag{4}$$

where FH_t (first half of the month) takes a value of 1 if day *t* falls between trading days -1 through +8 relative to the TOM, otherwise zero. SH_t (second half of the month) equals 1 if day *t* falls within the range of trading days from -10 to -2 relative to the TOM. The first periods of the month (FH and FT) begin at day -1 as in the literature (see e.g. Ariel 1987; Gerlach 2007; Nikkinen et al. 2007a). The variables in Equation (4) are described as follows. FT_t (first third of the month) takes a value of 1 if day *t* constitutes a trading day between -1 and +6 relative to the TOM and otherwise equals zero. ST_t (second third of the month) takes a value of 1 if day *t* falls within the range from +7 to +13, otherwise zero. Using similar logic LT_t (last third of the month) takes a value of 1 if day *t* falls within the range +14 through +20, otherwise zero.

In the next phase on the way to determining whether the U.S. macroeconomic news announcements possibly explain the TOM and intramonth effects on the Finnish market we investigate whether the U.S. macroeconomic news announcements affect stock returns on the Finnish market and can therefore be counted as possible causes for the TOM and intramonth effects. The following regression model is constructed to answer this question:

$$r_t = c + \sum_{m=1}^{10} \alpha_m MACRONEWS_{m,t} + \varepsilon_t \tag{5}$$

where r_t is the return for the OMXH25- index on day *t*, *c* is the intercept, $MACRONEWS_{m,t}$ is defined as the dummy variable for the macroeconomic news announcements $(m = ISMI_1, ISMS_2, EMP_3, ..., ECI_{10})$ and takes a value of 1 if the news *m* occurs and otherwise zero.

Finally, to determine whether or not the U.S. macroeconomic news announcements are the reason for the TOM and intramonth effects on the Finnish market, the residuals ($resid_t$) i.e. the error terms estimated from Equation (5) are investigated. These residuals can be thought of as the portion of stock returns that are orthogonal to the risk premiums related to the macroeconomic news announcements, i.e. the effect of U.S. macroeconomic news has been wiped out from the return series. Consequently, if the U.S. macroeconomic news announcements are the reason for the effects, then the effects should not be observed in the residuals estimated from Equation (5). To investigate these issues, the following regression equations are estimated:

$$resid_t = \sum_{i=-9}^{9} \alpha_i D_{i,t} + \alpha_0 ROM_t + \varepsilon_t \tag{6}$$

$$resid_t = \alpha_1 FH_t + \alpha_2 SH_t + \varepsilon_t \tag{7}$$

$$resid_t = \alpha_1 FT_t + \alpha_2 ST_t + \alpha_3 LT_t + \varepsilon_t \tag{8}$$

where $resid_t$ refers to the residuals taken from Equation (5) and the other variables are as previously defined. If U.S. macroeconomic news announcements explain the effects on the Finnish market, then the coefficients for the dummy variables should not differ from zero.

5. Results

To find out whether the Finnish stock market does indeed experience a TOM effect we have to examine the regression results from Equation (1). The results are displayed in Table 2 and show significant positive abnormal returns for days +1 and +2 with respect to the TOM. The results are in line with earlier results (see e.g. Lakonishok et al., 1988; Nikkinen et al., 2007b) and they show that the TOM effect is evident for a few days around the TOM. Day -3 is also positively significant but out of the sample TOM days (-1 and +3). All regression equations used are corrected for heteroscedasticity with generalized autoregressive conditional heteroscedasticity (GARCH) terms.

(Insert Table 2 about here.)

The intramonth effect on the Finnish market is investigated with Equations (3) and (4), where the month is divided first into two parts and then into three parts. The results in Table 3 show a clear intramonth effect, and therefore, they are in line with the results reported in the literature (see e.g. Ariel, 1987; Lakonishok et al., 1988; Nikkinen et al., 2007b). The returns on the OMXH25 index are significantly higher in the first half and first third of the month. The returns on the

remaining segments of the month are not significant. These results concur in principle with the findings of Nikkinen et al. (2007b) but do not show an especially strong intramonth effect when the month is divided into three segments.

(Insert Table 3 about here.)

Table 4 presents the results of Equation (5), showing the effect of U.S. macroeconomic news announcements on the Finnish stock market. In contrast to the results presented in the literature we do not find the employment report to have a significant influence on the Finnish market (see e.g. Bollerslev et al., 2000; Nikkinen et al., 2001; Graham et al., 2003; Nikkinen et al., 2006). However, we find that the reports on consumer confidence, gross domestic product, ISM index (previously entitled NAPM manufacturing report) and import and export price indices do have a significant influence on the Finnish market returns.

(Insert Table 4 about here.)

The TOM effect disappears after the macroeconomic news announcement effect has been controlled for and is consistent with previous findings (see e.g. Nikkinen et al. 2007a; Nikkinen et al. 2007b). This investigation is done by estimating Equation (6), where the residuals from Equation (5) were regressed with the day of the month dummies. The coefficient estimate for either day is no longer significant at the 5% level as can be seen in Table 5.

(Insert Table 5 about here.)

The results of Equations (7) and (8) are reported in Table 6. The results show whether the U.S. macroeconomic news announcements affect the intramonth anomaly found on the Finnish stock market. If the intramonth effect is explained by the macroeconomic news announcements, the dummy variables from the regression models (7) and (8) should not be statistically significant. The results demonstrate that, once the effect of the U.S. macroeconomic news announcements is taken into account, the intramonth effect disappears in both cases. The results are consistent with similar studies on the effects of U.S. macroeconomic news announcements on the U.S. market as well as on major European markets (see e.g., Gerlach, 2007; Nikkinen et al., 2007a; Nikkinen et al., 2007b).

(Insert Table 6 about here.)

6. Conclusions

This study investigates whether TOM and intramonth effects can be found on the thinly traded Finnish stock market and if these anomalies can be explained by the release of major U.S. macroeconomic news announcements that are clustered around the turn-of-the-month. The study is motivated by the special features of the Finnish stock market and its integration into the financial world.

The critical findings of this study were not the discovery of the TOM and intramonth effects but rather the results found to cause these anomalies on the Finnish stock markets, namely clustered U.S. macroeconomic news announcements. Both the TOM and the intramonth effects disappear after the effect the U.S. macroeconomic news announcements on the Finnish market has been controlled for, which in other words means that they create these phenomena. These findings support the hypothesis developed. The results are also in line with the studies on larger markets (see Gerlach 2007; Nikkinen et al. 2007a; Nikkinen et al. 2007b). Out of the ten macroeconomic news announcements investigated the consumer confidence, gross domestic product, the import and export indices and the ISM index were found to have a significant influence on the Finnish market. The results provide further evidence that the global financial markets are integrated and that investors should not turn a blind eye to events that may seem remote. Despite our results that support the hypotheses, it is warranted that the limited sample, i.e. rather short sample period from a single stock market, may affect these results. Thus, our suggestion for future research is as follows. Using a longer data set, it would be interesting to examine whether the TOM and intramonth anomalies on world-wide stock markets (e.g., Asia and emerging stock markets) can be explained by U.S. macroeconomic news announcements.

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Notes

Note 1. On the impact of macroeconomic news announcements of financial markets see e.g. Patell & Wolfson (1981), Ederington & Lee (1993), Bollerslev, Cai & Song (2000), Graham, Nikkinen & Sahlström (2003).

Table 1. Macroeconomic news announcements.

Report m:	Symbol	Interval	# of releases	Release date[a]
1. Institute for Supply Management[b]: Manufacturing	ISM	Monthly	84	1.0
2. Institute for Supply Management[b]: Non-manufacturing	ISMS	Monthly	84	3.0
3. Employment	EMP	Monthly	84	4.0
4. Retail Sales	RS	Monthly	83	9.3
5. Producer Price Index	PPI	Monthly	84	9.9
6. Import and Export Price Indices	IEPI	Monthly	84	10.4
7. Consumer Price Index	CPI	Monthly	84	11.8
8. Consumer Confidence	CONSCON	Monthly	82	18.8
9. Gross Domestic Product	GDP	Quarterly	28	19.4
10. Employment Cost Index	EMPCOST	Quarterly	28	19.7

NOTES: a) Average release day of the month measured by trading days.

b) ISM reports were previously titled National Association of Purchasing Management reports.

Table 2. The existence of the turn-of-the-month effect.

	OMXH25		
TOM-days	Estimate	t-statistic	p-value
-9	0.0014	1.2751	0.2023
-8	-0.0009	-0.8748	0.3817
-7	0.0006	0.5717	0.5675
-6	0.0012	1.0429	0.2970
-5	-0.0018	-1.4733	0.1407
-4	-0.0014	-1.3278	0.1843
-3	**0.0027**	2.3091	0.0209
-2	0.0016	1.6787	0.0932
-1	0.0009	0.7711	0.4406
1	**0.0044**	3.5264	0.0004
2	**0.0024**	2.5067	0.0122
3	0.0007	0.5933	0.5530
4	0.0018	1.8155	0.0695
5	-0.0011	-1.0971	0.2726
6	-0.0004	-0.2773	0.7816
4	0.0022	1.8618	0.0626
8	-0.0009	-0.7741	0.4389
9	0.0012	1.1740	0.2404
ROM	0.0005	0.8315	0.4057
C	0.0000	3.9899	0.0001
ARCH(1)	0.0717	6.9972	0.0000
GARCH(1)	0.9160	87.0775	0.0000

The regression formula takes the following form: $$r_t = \sum_{i=-9}^{9} \alpha_i D_{i,t} + \alpha_0 ROM_t + \varepsilon_t$$

where r_t is the stock market return at time *t, i* refers to the days around the TOM (-9, -8, …, +8, +9), $D_{i,t}$ stands for the dummy variable taking a value of 1 on day *i,* otherwise zero, ROM_t is also a dummy variable that takes a value of 1 on the days that fall within the group outside of the TOM days (i.e. other than -9, -8, …, +8, +9), otherwise zero. In the equation α_i and α_0 are the coefficients and ε_t stands for the disturbance term. The regressions are corrected for heteroscedasticity with GARCH terms. Estimates that are significant at the 5 % level are in bold face.

Table 3. The existence of the intramonth effect.

	OMXH25		
Segments	Estimate	t-statistic	p-value
FH	**0.0011**	2.8977	0.0038
SH	0.0005	1.4885	0.1366
C	0.0000	4.3963	0.0000
ARCH(1)	0.0651	7.3340	0.0000
GARCH(1)	0.9232	101.5089	0.0000
FT	**0.0012**	2.9572	0.0031
ST	0.0005	1.2363	0.2163
LT	0.0003	0.7753	0.4381
C	0.0000	4.4460	0.0000
ARCH(1)	0.0650	7.3274	0.0000
GARCH(1)	0.9231	102.0617	0.0000

The regression formula takes the following form: $r_t = \alpha_1 FH_t + \alpha_2 SH_t + \varepsilon_t$

$$r_t = \alpha_1 FT_t + \alpha_2 ST_t + \alpha_3 LT_t + \varepsilon_t$$

where FH_t (first half of the month) takes a value of 1 if day *t* falls between trading days -1 through +8 relative to the TOM, otherwise zero. SH_t (second half of the month) equals 1 if day *t* falls within the range of trading days from -10 to -2 relative to the TOM. The first periods of the month (FH and FT) begin at day -1 as in the literature. The variables in Equation (4) are described as follows. FT_t (first third of the month) takes a value of 1 if day *t* constitutes a trading day between -1 and +6 relative to the TOM and otherwise equals zero. ST_t (second third of the month) takes a value of 1 if day *t* falls within the range from +7 to +13, otherwise zero. Using similar logic LT_t (last third of the month) takes a value of 1 if day *t* falls within the range +14 through +20, otherwise zero. The regressions are corrected for heteroscedasticity with GARCH terms. Estimates that are significant at the 5 % level are in bold face.

Table 4. Impact of macroeconomic news announcements on stock returns.

	OMXH25		
Macroeconomic releases	Estimate	t-statistic	p-value
CC	**-0.0040**	-4.1735	0.0000
CPI	0.0001	0.0820	0.9346
ECI	-0.0008	-0.3959	0.6922
EMP	0.0007	0.5886	0.5561
GDP	**0.0049**	2.2245	0.0261
ISMI	**0.0033**	2.6826	0.0073
ISMS	-0.0014	-1.1333	0.2571
PPI	-0.0015	-1.2936	0.1958
RS	0.0008	0.6649	0.5061
IMP/EXP	**-0.0021**	-2.2041	0.0275
C	**0.0009**	3.1370	0.0017
C	0.0000	4.3057	0.0000
ARCH(1)	0.0697	7.4777	0.0000
GARCH(1)	0.9180	95.1458	0.0000

The regression formula takes the following form: $r_t = c + \sum_{m=1}^{10} \alpha_m MACRONEWS_{m,t} + \varepsilon_t$

where r_t is the return for the OMXH25- index on day *t*, *c* is the intercept, $MACRONEWS_{m,t}$ is defined as the dummy variable for the macroeconomic news announcements $(m = ISMI_1, ISMS_2, EMP_3, ..., ECI_{10})$, that takes a value of 1, if the news *m* occurs and otherwise zero. The regressions are corrected for heteroscedasticity with GARCH terms. Estimates that are significant at the 5 % level are in bold face.

Table 5. Impact of macroeconomic news announcements on the TOM effect.

	OMXH25		
TOM-days	Estimate	t-statistic	p-value
-9	0.0006	0.5684	0.5698
-8	-0.0015	-1.5944	0.1108
-7	-0.0003	-0.3140	0.7535
-6	0.0003	0.2535	0.7999
-5	-0.0022	-1.8136	0.0697
-4	-0.0009	-0.9068	0.3645
-3	0.0022	1.8965	0.0579
-2	0.0007	0.6851	0.4933
-1	0.0007	0.6354	0.5252
1	0.0004	0.3350	0.7376
2	0.0013	1.3966	0.1625
3	0.0008	0.7086	0.4786
4	0.0010	1.0032	0.3158
5	**-0.0023**	-2.3874	0.0170
6	-0.0013	-0.9210	0.3571
7	0.0017	1.5147	0.1298
8	-0.0014	-1.2895	0.1972
9	0.0009	0.8388	0.4016
ROM	-0.0001	-0.1690	0.8658
C	0.0000	3.9530	0.0001
ARCH(1)	0.0733	7.1882	0.0000
GARCH(1)	0.9144	86.7443	0.0000

The regression formula takes the following form: $resid_t = \sum_{i=-9}^{9} \alpha_i D_{i,t} + \alpha_0 ROM_t + \varepsilon_t$

where $resid_t$ refers to the residuals taken from Equation (5) and the other variables are as previously defined. If U.S. macroeconomic news announcements explain the effects on European markets, then the coefficients for the dummy variables should not differ from zero. The regressions are corrected for heteroscedasticity with GARCH terms. Estimates that are significant at the 5 % level are in bold face.

Table 6. Impact of macroeconomic news announcements on the intramonth effect.

	OMXH25		
Segments	Estimate	t-statistic	p-value
FH	0.0001	0.2661	0.7901
SH	-0.0001	-0.2262	0.8211
C	0.0000	4.3723	0.0000
ARCH(1)	0.0698	7.5552	0.0000
GARCH(1)	0.9180	95.9436	0.0000
FT	0.0001	0.2161	0.8289
ST	0.0000	0.0148	0.9882
LT	-0.0002	-0.5855	0.5582
C	0.0000	4.4282	0.0000
ARCH(1)	0.0695	7.5624	0.0000
GARCH(1)	0.9183	96.6917	0.0000

The regression formula takes the following form:

$$resid_t = \alpha_1 FH_t + \alpha_2 SH_t + \varepsilon_t$$

$$resid_t = \alpha_1 FT_t + \alpha_2 ST_t + \alpha_3 LT_t + \varepsilon_t$$

where $resid_t$ refers to the residuals taken from Equation (5) and the other variables are as previously defined. If U.S. macroeconomic news announcements explain the effects on European markets, then the coefficients for the dummy variables should not differ from zero. The regressions are corrected for heteroscedasticity with GARCH terms. Estimates that are significant at the 5 % level are in bold face.

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Back to the Basics: A Process Approach for Managing Portfolio Risk

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Abstract

This paper examines the traditional views of risk in the finance and economics literature as applied to portfolio management. The paper demonstrates the inherent weaknesses in such approaches and suggests a process framework as a method for portfolio managers to manage risky situations. The framework incorporates seven considerations which may include both quantitative and qualitative factors which will affect the value of each consideration. The framework logically links the considerations to nine potential strategies for the management of a risky situation. The use of the framework provides a systematic approach to the management of a risky situation which should lead to improved performance.

Keywords: Risk Management, Portfolio Management, Investments

1. Introduction

Portfolio management involves investing capital in a variety of investment instruments and opportunities. The nature of the job involves decision making under uncertainty and risk. Risk can vary with various contexts; however, a systematic method which incorporates the calculative aspects of risk and the judgment of the portfolio manager can aid in the process of risk management and promote the development of knowledge through learning and development of tacit knowledge. Applying the learning and tacit knowledge and not strictly relying on computational risk management may prove a more effective method of managing risk.

Finance and specifically portfolio management (Markowitz, 1952) have typically used a minimum variance model to measure and manage risk. The goal is for zero variance around a benchmark. If the benchmark is the market return, the goal is to perform at the market level. The variance around a target implies risk is a two-sided phenomena with an upside risk and downside risk with the goal being to balance the poor returns with the good returns. "Upside risk" seems a rather odd concept. Investors would ideally prefer to avoid downside risk and earn all positive returns. "Upside risk" would be desirable and downside risk should be avoided.

Risk is an emergent phenomenon dependent on the complexity of a given situation. There is not a precise measurement possible for risk. For example, if one wishes to avoid poverty, a risk measure related to the potential for a large loss may be appropriate while if one wishes to demonstrate investment performance a measure related to a target return may be a more appropriate measure. There is no all encompassing measurement of risk yet the academic literature regarding financial risk continues to regard risk as a known variable that can be measured and manipulated. The attempt to measure and manipulate the unknown results in outcomes which demonstrate the problems of the theory. The use of computer models that calculate risk and derivatives to manage risk can result in false levels of security as demonstrated by the recent financial crisis.

The measurement and the manipulation of the unknown seems a rather odd pursuit. Are the theorists attempting to ask the epistemological question, "How do you know what you do not know?" This paper briefly describes the historical development of risk measures used in finance and economics to provide the reader with a background of how the field has arrived at the current state. To achieve this, a brief discussion of probability theories is provided for background and the development of risk measures by economists is provided.

Olsen (1997) surveyed portfolio managers to identify what investment professionals consider the key characteristics of risk. The factors considered by the portfolio managers are different than risk as identified in the finance/economic literature but consistent with concepts of risk in more general managerial situations. The paper then demonstrates how a general process framework for managing risky situations (Mackenzie, 1998) can be applied to portfolio management. Examples which apply the framework to hypothetical investment decisions a portfolio manager would make regularly are developed to demonstrate the usefulness of the process framework to portfolio risk management.

2. The Basis of Risk Measurement: Probability Theories

The fundamentals underlying the different concepts of risk are various probability theories. These different probability theories are: classical probability, relative frequency probability, logical probability, subjective probability and behavioral probability. Each is briefly described below (Weatherford, 1982).

Classical Probability: The probability of an event is the ratio of the number of ways the event can occur to the total number of outcomes. Classical probability applies to games of chance such as games involving dice or cards.

Relative Frequency Probability: This probability of an event is the limit, as the number of trials increases, of the ratio of the number of times the event has occurred to the number of trials.

Logical Probability: Logical probability is the probability of an event's occurrence expressed as the degree of rational belief relative to the given information.

Subjective Probability: The probability of an event is the quantitative degree of individual belief in the event's occurrence.

Behavioral Probability: The probability of an event is the non-quantitative degree of individual belief in the event's occurrence.

3. The Historical Development of Financial and Economic Risk Measures (Note 1)

Prior to 1900 risk was primarily dealt with in the context of insurance. Edgeworth wrote one of the first articles applying probability theory to historical cash flows to estimate cash reserve requirements. Before the end of the 19th century, the relationship between probability and risk was being explored. Generally, the early applications were concentrated in the area of insurance and used relative frequency probabilities to develop risk measures. Relative frequency introduces issues to risk measurement which do not hold. In order to use relative frequency, a representative sample must be present to develop risk measures. Therefore, without relative frequencies risk would not be present; however, risk *does exist* when the statistical data does not. Relative frequency probability measures of risk require trials and statistics to develop the relative frequency probabilities; therefore, risk and relative frequency probabilities are not the same.

One of the most cited early discussions of risk is that of Frank Knight. Knight (1921) included risk and uncertainty in his work but he did not consider risk and uncertainty to be the same. According to Knight, uncertainty was not quantifiable. Risk was a known chance based on a known probability distribution while uncertainty deals with a subjective probability that is not known. According to Knight there exists some inherent "unknowability" for a given decision. Knight argued business decisions deal with such unique conditions that statistical data of relative frequencies although useful did not represent the "unknowable" outcomes of the future. "The business man himself not merely forms the best estimate of the outcome of his actions, but he is likely also to estimate the probability that his estimate is correct." (Note 2) Hence, there is an estimate of an estimate.

Subjective probabilities are those that are of economic interest, but developing frequency probabilities from unique conditions is not possible. Therefore, risk was usable for known distributions while uncertainty, dealt with the unknown. His objections to defining risk were relative frequency issues, law of large numbers and representative samples. Florence used a similar model of risk and discussed risk and uncertainty using three factors: the value of the probability, the theory of the probability, and the precision of the value where precision could be determined statistically or subjectively. Florence like Knight and others realized the "unknowable" factors inherent to risk.

Entering the 1930's, probabilistic measures of risk had been rejected primarily because the belief was a probabilistic measure of risk was not appropriate for economic activity. Each situation was unique; therefore, no relative frequencies existed. The theoretic issues were too great to be ignored and required significant simplification. Knight and others did not agree with the omniscience required by the classical economists. There was thought to be no reference class and even if reference classes existed the law of large numbers eliminates risk if and when relative frequencies are stable.

However, this began to change in the late 1930's and early 1940's. During this time period there was an exodus of German and Austrian economists whose background was mathematics. They believed probability distributions based on relative frequencies were useful and provided a tool for the measurement of risk. The issues thought to have been too great to ignore by Knight and others were disregarded. This began the movement away from Knight's definition of risk and uncertainty. Since that period, risk has generally been measured using probability and statistical measures of dispersion. The issue with historical probability distributions is there is no such thing as a conclusive empirical test. The world involves infinite processes of which we have limited observations nevertheless risk measurement has proceeded as if complete knowledge is available. The orthodox economists proceed with the premise uncertainty has a minimal role because rational, utility maximizing individuals are able to eliminate the risk with the historical information at hand.

Arrow (1965) discusses the state of the world that if true and known all actions would be known. This state is related to a relative strength of belief in the occurrence of the different states of the world and these may vary from objective measurements. Arrow appears to understand some of the limitations but determines the way to proceed is to "face the questions and difficulties firmly and proceed." Nevertheless, probabilities based on relative frequencies are the preferred methodology in the finance field and have advanced new approaches to risk management. Extreme value

theory has cultivated new risk management strategies and measurement techniques which model the tails of a probability distribution in a different manner.

The economic value of the different risk management strategies remains a question and these new approaches do not predict extreme events. Extreme value theory adds more complicated mathematical models to a distribution with the same limitations as before. The goal appears to become more precise at measuring a probability distribution which is not knowable. More complicated mathematics is being applied to the same problem which has the assumed problems as discussed previously. Complicated math does not cure the ills of the assumptions; the patient still has the same disease. These new high powered models would be consistent with the words of Malkiel in 1982:

"The quest for better risk measures is not simply an amusing exercise that accomplishes only the satisfaction of permitting academics to play with their computers. It has important implications for protecting investors."

4. The Finance Domain and Limitations of Traditional Risk Measurement

Relative frequency probabilities are used in the finance domain. Past events are used to develop a historical probability distribution which is used to determine the probabilities of future events. The inherent assumptions of relative frequency models as outlined by Frankfurter and McCoun (1996) are:

Historical relative frequencies can be interpreted as the probability of future events.

Future single events cannot be isolated.

Future events must be part of a series of events in order to have a numerical probability.

There is no information outside of the historical relative frequency of an event that is relevant to the estimation of the probability of the event.

These assumptions raise a number of questions such as relationships to reference groups. The use of reference groups assumes the historical events are the same as the future events. This implies the participants and conditions of the past will be repeated in the future. However, the participants change (learn) and the operating environment is different; therefore, there is not a true reference group for determining the probabilities to be used.

A second issue involves the implications implied by the law of large numbers. The law of large numbers states as the number of trials increases, the results should converge to the expected value with less deviation. As the number of trials approaches infinity the deviation around the expected value approaches zero. The mean is the expected value and the deviation or risk measurement is the standard deviation or variance. If an investor invests in an asset with an expected annual return of 15 percent and a standard deviation of 8 percent, and the holding period approaches a large number according to the law of large numbers the expected return should be equal to 15 percent. There will be some variance in the short term as indicated by the deviation measure. If an investor holds the referenced security for a long period the distribution would hold and returns would be 15 percent with some variation based on the statistical measures of the distribution. The application of the deviations focuses on the short term but is based on long-term data assumed to be stable enough to determine the deviation. If the model is stable enough to determine the deviation, a reasonable assumption would be the model is stable enough to determine the expected returns. The law of large numbers would imply a virtual elimination of the risk if the risk is held for a long period and the distribution is stable.

Relative frequency depends on the existence of a real distribution. However, will the behavior of the market participants in the future be predicted by the past? Will the external environment be duplicated in the future? Prior to September 11th, most people did not include a risk factor for a terrorist attack on U.S. soil yet the risk existed. The Enron debacle has introduced new risks for corporate governance issues and possible risk related to auditor selection (Peregrine among others). There was no historical data to predict such events, yet these events have had significant influence on the financial markets and insurance industry. More recently, the collapse of the housing market and issues with collateralized debt obligations have had a negative impact on financial markets despite complicated risk management tools. Strictly applying relative frequencies would not result in real distributions which include these events. Without the real distributions relative frequencies exist but the actual probabilities do not because of the unknown events.

These issues are not routinely raised in the finance and economics literature. Relative frequencies are developed and applied without question. However, as the historical discussion demonstrates this has not always been the case. The inherent problems were recognized by Knight 80 plus years ago and are difficult for the mathematics to calculate. The problems made the German-Austrian mathematician-economists mathematical models difficult to use and interpret. Therefore, the problems were disregarded and despite the same valid exceptions, economists have continued to use these models which are based on perfect knowledge and perfect rationality.

5. The Application of the Theory

The work solidifying the variance minimization approach in the field of finance and portfolio management is Markowitz's work (1952). Markowitz studied how investors construct portfolios and approached the issue as a

normative study to understand whether investors' approaches were consistent about their beliefs of means, variances and covariance. However, the paper has been used as a positive study and has been used to develop CAPM and has extended portfolio theory despite many limitations. Markowitz himself concluded his work was a guide and provides a prescription under the following conditions: risk aversion, one time period, and an expected utility function that is quadratic. (Note 3)

Applying the theory would lead the portfolio manager to statistically determine the optimal portfolio by considering the beta coefficients and covariance of the investments in order to have a portfolio on the efficient frontier. Extreme applications of the theory would indicate a portfolio can be managed by considering the statistical characteristics of the past movements of the equities price. The extreme application of the theory would lead one to conclude the economic characteristics of the investment (i.e. what the firm makes, markets, and sells) are not the important components of the individual investment and the portfolio; what matters are past price movements and statistical measures of those price movements and some measure of the risk.

Traditionally, portfolio management theory has desired to minimize variance to some expected or target return with the benchmark most often considered to be the return of the S&P 500. Strictly applying the theory, the intent would be to minimize the variance around the return of the S&P 500. The return of the S&P 500 is not a constant so the variance is minimized relative to a moving target which may be troublesome. Assuming the target is known (and fixed) and the theory is strictly applied, the returns should equal the returns of the market. Applied to a typical mutual fund, the investor will likely never see returns as great as the market return. For the investor, the return less expenses, management fees and the need for some cash for redemptions is left with returns below the goal of market return despite the fact the manger may have achieved the stated goal.

To our portfolio manager:

Thank you very much for disregarding the business of the businesses you hold in the portfolio. By applying your wonderful statistical models to the portfolio and reducing the risk associated with our investment you have guaranteed our investment a return of less than the market return. We will be forever grateful for your blind faith in a theory that despite its many limitations you have continued to implement.

Signed your investors.

The theory was developed making inferences from the data regarding the agent's behavior (the outcomes) and not directly observing the behavior. Therefore, when applying the theory to the extreme, as demonstrated above, the inherent weaknesses are exposed. As stated by Warren Buffett, "the academics' definition of risk is far off the mark, so much so that it produces absurdities." (Note 4)

6. Portfolio Managers Key Risk Characteristics

Olsen (1997) surveyed professional portfolio managers who had responsibility for institutional investment portfolios in order to develop an understanding of characteristics of risk considered important by investment professionals. The survey results indicate portfolio managers do not consider variance or large positive returns as important considerations of risk. According to the survey, the major risk characteristics for portfolio managers are:

a large loss (i.e. loss of principle large drop in price, negative return)

return below a target (i.e. downward price fluctuation, cut in dividend, nonpayment of interest)

knowledge (i.e. amount, quality, and timeliness of information about firm)

ability to control, particularly losses.

These results are similar to managerial views of risk in other domains. March and Shapira (1987) indicate managers do not treat uncertainty about positive outcomes as an important aspect of risk which is consistent with Olsen's findings dealing with portfolio managers. March and Shapira found managers believe risk is manageable and can be reduced by using skills to reduce the risk. Olsen's results discuss control as being important to the portfolio managers particularly with respect to avoiding losses and being able to take action to avoid losses. The portfolio manager's control the investments in the portfolio and use their judgment to manage the risks of the portfolio. Similar to March and Shapira findings, the portfolio managers believe risk is manageable as indicated in control representing an important characteristic of risk. Another similarity is managers look for alternatives to meet targets. The portfolio managers indicated not meeting a target return is an important attribute of risk. On a daily basis portfolio managers alter the holdings of the portfolio in an attempt to meet a target. Portfolio managers on a regular basis buy and sell securities with the objective being to meet a target which was identified as an important aspect of risk by respondents in Olsen's survey.

Olsen's results are similar to those of March and Shapira regarding the manager's concept of risk. These concepts are not entirely probabilistic as traditional finance and decision science theory would lead us to believe. There are tacit and

intuitive processes affecting the risk management processes and strategies dealing with risk.

Olsen (2000) indicates investment professionals rely less on quantitative methods as predictability declines. Judgment becomes more important in volatile markets, in evaluating volatility and evaluating small firms. This judgment would be the result of experience and learning. According to the professionals, the quantitative methods are more appropriate when more information is available; however, as less information is available the tacit knowledge of the expert becomes more important in the risk considerations. Therefore, if tools are available to improve decision making in risky situations, learning can result, knowledge can result and better risk management strategies can be implemented in future risky situations.

7. Managing Portfolio Risk in a Process Framework

7.1 The Risk Situation Framework

Mackenzie (1998) introduces a comprehensive framework for managing risky situations which includes seven considerations and nine strategies. The systematic approach allows for consistent risk management, and learning due to the consistent approach. Figure 1 provides the model's framework.

(Insert Figure 1 about here)

The framework includes nine strategies for managing the risky situation. They are:

s_1 = Do nothing

s_2 = Retreat from the risky situation

s_3 = Defensive coping

s_4 = Exert power internally

s_5 = Aggressive defense

s_6 = Maneuver for personal advantage

s_7 = Prospect for a lever in order to gain more internal control

s_8 = Independent control of the sources of the risky situation

s_9 = Strategic levering

The strategy chosen is not dependent on the activity of the market that day or the latest news event. The strategy will depend on the consistent application of seven considerations of the framework which offer the portfolio manager the flexibility to use their own judgment. The considerations are:

c_1= Is the entity aware that it is facing a risk event?

c_2 = Is there significant risk?

c_3 = Is the risky situation avoidable?

c_4 = What are the sources of the risky situation?

c_5 = What is the strength of the coupling of these sources?

c_6 = Can the entity influence the external sources of the risky situation?

c_7 = Can the entity control the internal sources of the risky situation?

A brief description of each consideration is provided below. For a more complete development of the considerations and framework see Mackenzie (1998).

Each potential investment decision will represent some risk. Consideration c_1, simply asks if the entity is aware of the risk and is a simply binomial result where:

c_1 = 1 if yes,

= 0 if no.

If the portfolio manager is not aware of the risk event, the strategy would be to do nothing.

The second consideration (c_2) defines significant risk which introduces a risk measure which could be analytical or subjective. Various risk measures could be used to define the significant risk where a significant risk is defined as a risk measure being above an acceptable threshold. The process framework allows for flexibility because the value of the risk measure may vary based on the conditions and context of the situation. If the risk measure is unacceptable to the portfolio manager, the risk would be significant. An example of a possible risk measure consistent with Olsen's survey results would consist of a downside risk measure or below target return measure. The risk significance can vary based on the calculation of the risk measure, the given situation and the individual portfolio manager. Another example may

be the value or understanding of the underlying assets of a securitized instrument.

Consideration c_3 asks whether a risky situation can be avoided. Controls could be used to place limits on the manger such as given percentages of the portfolios assets in one investment, if an investment becomes too risky the investment could be sold.

Considerations c_4 and c_5 are related (source of risky situation and strength of coupling of these resources) to interdependence, interdependence uncertainty and power. The purpose of this paper is not to define these terms. For a full explanation of these concepts see Mackenzie (1998). Interdependence exists if the actions of one part can affect and be affected by the actions of another part. Interdependence uncertainty relates to the relationships between two parties and the uncertainties within the relationship. Power is defined by Mackenzie as the effective control of interdependence.

Consideration c_4 indicates the sources of interdependence uncertainty and can be represented by one of three results.

c_4 = 2 if there are both external and internal interdependence uncertainty = 1 if there is only external interdependence uncertainty = 0 if there is only internal interdependence uncertainty.

Consideration c_5 indicates the strength of the coupling between the external interdependence uncertainty (E-IDU) and internal interdependence uncertainty (I-IDU).

c_5 = 1 if coupling between the E IDU and I-IDU is judged to be strong = 0 if the coupling between the E-IDU and I-IDU is judged to be weak.

Considerations c_6 and c_7 relate to the influence and control of external and internal sources of interdependence. Consideration c_6 asks if the entity can influence the external sources of the risky situation and consideration c_7 asks if the entity can control the internal sources of the risky situation.

c_6 = 1 yes the entity believes it can influence the E-IDU = 0 no

c_7 = 1 yes, if the entity believes it can control its I-IDU = 0 no.

7.2 Example: Portfolio Manager of Large Pension Fund

In this example the risky situation is managed by the portfolio manager of a large pension fund which has been known to attempt to influence firms in which the fund has significant ownership. The situation involves an existing stock holding where management of the firm is attempting to adopt a policy detrimental to shareholders. In similar situations, the implementation of similar policies has resulted in loss of market value. An example would include the adoption of poison pills. The decision had been made previously to invest in the firm so the process framework had previously indicated the investment would be acceptable using the process framework. The context has changed based on a potential decision by the firm. The portfolio manager is aware of the risk in any investment; therefore c_1 would be a yes. The significance of the risk would be related to the risk measurement used by the manager. The manager determines that if the new policy is adopted by the shareholders there will likely be a significant drop in the market value of the firm. Therefore, there is significant risk and c_2 is yes.

The next consideration is whether the risk is unavoidable. Obviously, the manager could sell the security. However, there will be tax consequences to the sale of the stock. The manager controls a large block of shares and liquidating a large block could also adversely affect the value of the current investment. In addition, except for the possibility of the new policy, the portfolio manager believes the prospects of the firm are good and the firm in its current condition represents an acceptable investment. Therefore, at this time the risk is considered unavoidable. The source of the risk in this situation is external due the firm's decision and internal due to the current determination the manager would prefer to continue to hold the investment. The manager has been successful in the past in influencing the outcomes of shareholder votes. Therefore, it is believed strong coupling (c_5) is present. The manager also believes threatening to sell a large block of shares may affect management's decision; therefore, c_6 is yes. The control of internal sources (c_7) is yes. Therefore the strategy is strategic leveraging, s_9.

To implement the strategy, the manger could take a position which offsets the current position and unwind the positions after the shareholders vote. If the vote results in a decision considered detrimental to shareholders the hedged position will increase in value proportionally to the loss in value of the original position. By implementing the strategy the risky situation is managed in such a way losses (if any) will be minimal.

For each of the considerations there was not an inclusive quantitative method for the decision involved in managing the risk. The outcome of the shareholders vote is not known; the manager would need to base that decision on past experience and knowledge of the shareholders. There would not be relative frequency probabilities to predict these future events; a subjective probability relying on the portfolio manager's expertise would be necessary to analyze the situation.

Sub processes would be present at each consideration used by the portfolio manager to determine the value of each consideration. These sub processes could be modeled to develop a framework for each consideration node and further

unwrap the sub processes.

At each node, the factors considered are not usually determined by past price movements and beta coefficients. These statistical measures may come into play at some of the considerations such as c_2. The statistical measures represent the easy portion of the risk management. Judgment is required at each node which would be based on the portfolio manager's experience, tacit knowledge and expertise. The use of a systematic method provides the framework for consistent approaches to management of risky situations.

7.3 Example: Portfolio Manager of Small Fund

The second example is a small portfolio manager who does not control a large enough block of shares to be in a position to influence a policy change similar as described above. In this case, the considerations would provide the same results for considerations c_1, c_2, c_3 and c_4. However, in this case the source of the risk is external, but the strength of the coupling is weak and the portfolio manager has no influence over the external source of the risk (c_6 = no). Unlike the above example, based on the prospectus and regulations of the fund and description of the fund's investment practices provided to investors, the manager can not invest in derivatives, short or hedge positions. The portfolio manager is required to invest in equities with long positions, hold bonds or cash. In this situation c_7 is no and the resulting strategy is retreat from risk, s_2. The manager can control the uncertainty by selling the shares of stock held in the portfolio thus removing the risk of the potential market reaction to the policy change.

7.4 New Investment Decision

In this example, the portfolio manager is considering the purchase of stock in a firm previously not owned by the fund. Based on the recent past the firm has demonstrated tremendous earnings growth and the fundamentals appear to indicate continued appreciation in the stock price. As with any investment, the manager is aware there are risks involved. The risk involved does appear to be significant based on the manager's measure of risk which in this case the manger has elected to use the beta coefficient as the risk measure. For the firm under consideration, beta is 1.5 which is higher than the market beta of 1.0. Therefore, there is significant risk and c_2 is yes or 1. The portfolio owns stocks and each carries with them some risk. Risk is inherent to investing in equities and is unavoidable based on the prospectus of the fund, c_3 is yes or 1. In this example the risk is external and internal, ($c_4 = 2$). The coupling is considered weak ($c_5 = 0$). The fund is required to invest in equities and based on the risk measurement chosen the external risk is inherent to the firm and not influenced by the portfolio manager ($c_6 = 0$). In this case, the manager has a large amount of cash that due to requirements of the fund must be invested in equities which the portfolio manager chooses to purchase. The manager controls the buy/sell decisions of the portfolio ($c_7 = 1$) therefore, the resulting strategy is to exert power internally (s_4). The manager can exert power internally by purchasing the stock. The risk in the portfolio is increased by the manager's judgment to invest in this firm, but the manager's judgment concludes the investment represents a great opportunity.

8. Implications of the Process Framework to Portfolio Management

In section six of this paper, the odd results that can occur due to the application of traditional portfolio management risk techniques were demonstrated. If the portfolio manager uses backward looking statistics, a complete understanding of the context and inherent risk is not realized. There is more to a risky situation than the pure mathematical manipulation of the distributions. Expertise of the portfolio manager is more than considering the past price movements. The portfolio manager must rely on intuition and experience in evaluating the given risky situation.

Implementing the process framework as demonstrated allows the manager to consider risk factors and methods to control risk in a variety of situations using the appropriate strategy. By using such a framework, the manager is allowed the flexibility to measure risk in manners the manager deems appropriate and include other factors for the scenario. Mackenzie (1998) claims using the framework develops greater expertise by: organizing relevant considerations into a coherent pattern, making predictions of what strategy will be chosen, comparing between actual observations and predictions to learn, using the framework iteratively to incorporate changes of in the value of the considerations, analyzing different conclusions due to the different values and focus of different entities, providing a checklist to control the process and assist the entity to make more comprehensive decisions, stimulate tacit knowledge by iterative use of the framework, devising strategies for altering the decisions of others by working backwards through the framework to determine what others consider to be the key consideration and improving expertise by tapping different members of the decision making process.

Shenoy (2001) interviewed financial analysts and portfolio managers. The interviews indicated looking backwards at past decisions is not done. There is reevaluating in attempt to learn from past failures and strategies implemented by the portfolio manager or financial analyst. A framework which assists and provides a tool to reevaluate will improve the process and risk management of the portfolio manger as demonstrated above in the simple examples.

9. Conclusion

The problem of relying on the quantification of risk has produced some undesirable outcomes. In this paper some of the

issues related to the assumptions of quantifying risk and the resulting weaknesses have been discussed. Perhaps a more basic approach to each individual decision can be used to manage risk. As stated by Davidson:

"the economic system is moving through calendar time from an irrevocable past to an uncertain and statistically unpredictable future. Past and present market data do not necessarily provide correct signals regarding future outcomes. This means, in the language of statistics, that economic data are not necessarily generated by a stochastic ergodic process" (Note 7)

As portfolio managers have said, knowledge is important; however, complete knowledge is not possible which makes risk management for the portfolio manager critical. The way one can manage risk is by following a procedure and systematically applying the methodology to risky situations. By incorporating the process framework demonstrated here knowledge can be gained and risk management improved. The framework includes seven considerations which are linked to nine different strategies. The values of the considerations provide a framework which aids in implementing the proper risk management strategy.

This paper identified the issues and problems with traditional approaches to risk measures in finance and economics. Application of the theory was shown to provide odd results for the portfolio investors. As Thaler (1991) observes, "when economists restrict their investigations to those explanations consistent with the paradigm, to the exclusion of simpler and more reasonable hypothesis, the tool becomes a handicap". As demonstrated, by implementing the process framework, the portfolio manager could consider various aspects of the scenario which include quantitative as well as qualitative aspects of the risky situation. The consideration of the complete story will aid the portfolio manager in determining the appropriate risk management strategy and not strictly rely on computer models and risk quantification.

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Notes

Note 1. McGoun, E.G. (1995) provides a more complete description of the history

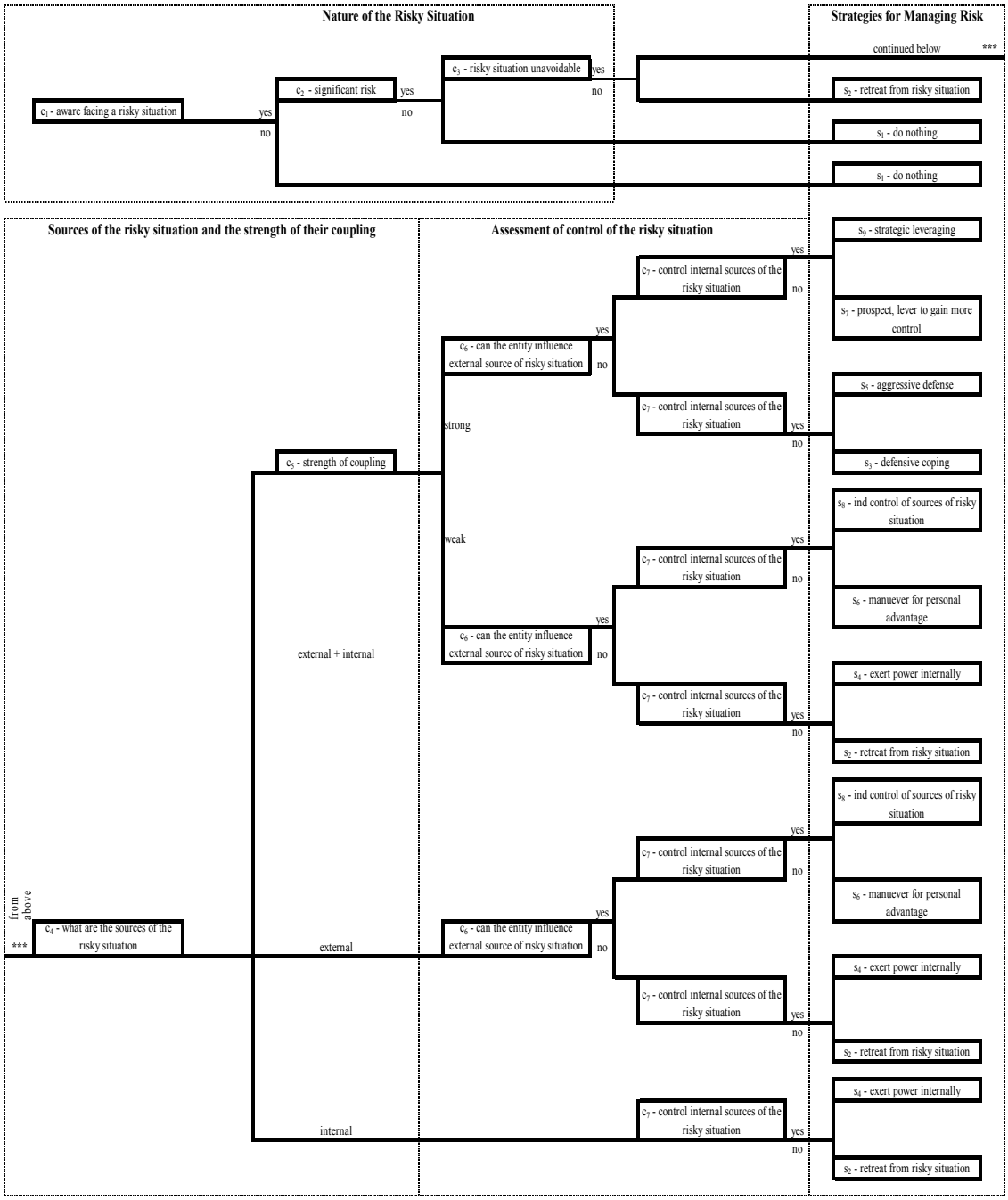
Note 2. Knight, F.R. (1921). *Risk, Uncertainty and Profit*. New York: Houghton Mid and Company.

Note 3. Schwartz, H. (1998). *Rationality Gone Awry? Decision Making Inconsistent with Economic and Financial Theory*. Westport, CT: Praeger Publishers.

Note 4. Cunningham, L. A., ed. (2001). *The Essays of Warren Buffett: Lessons for Corporate America*, New York: Cardozo Law Review.

Note 5. Davidson, P. (1982). Rational Expectations: a Fallacious Foundation for Studying Crucial Decision Making Processes. *Journal of Post Keynesian Economics*, 5, 182-198.

Selection of Strategies for Managing a Risky Situation (from Mackenzie 1998)



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Producer Service and the Added Value of Manufacturing Industries, An Empirical Research Based on Various Industries of Different Countries

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Abstract

This article makes an analysis in the mechanism that how producer service promotes the added value of manufacturing industries. Producer service is regarded as an important source of scare factors for value creation in manufacturing. Therefore, the rapid development of producer service leads to cost cut and efficiency promotion in manufacturing industries. Added value rate is then chosen as the measurement to the influence of producer service on manufacturing. An empirical research is made based on data from China, the Czech Republic, France, Japan, South Korea, Norway, the United Kingdom and the United States. It shows that more producer service is used as an input, higher rate of added value can a manufacturing industry gain from it.

Keywords: Producer service, Manufacturing, Added value

1. Introduction

Producer service is defined as the intermediary services provided for the production of other products or services, including R&D service, finance and insurance, logistics, management and engineering consulting, legal service, accounting, communications and information services, exhibitions, marketing, engineering and product maintenance, training, and real estate, and so on.

It is regarded that the rapid development of producer service owes to service outsourcing, which means that firms or plants buy from external market the intermediary service they needed. It is also called vertical decomposition, which means the service sector in a firm is separated from it. In a few researches, the definition of producer service also includes those from internal sectors, but in this paper only the external services are considered. The most outstanding characteristic of producer services is the wider application of modern information technology and advanced management tools. In other words, it is the knowledge intensive or technology intensive services, so it has been called in many papers as Knowledge Intensive Business Services (KIBS).

With the development of producer service, great changes have occurred in world economy. After World War II, especially since the 1970s, the developed countries have experienced "service revolution" one after another, that is, the proportion of the services in national output and employment rising rapidly, and become a leading industry of the national economy instead of manufacturing. Some developing countries, India for example, also have experienced such a revolution. There are three reasons to explain this.

1) Changes in demand. Clark (1951) found that the proportion of the service industry in GDP will increase as per capita income increases, because income elasticity of demand of service industries is larger than 1.

2) Difference in productivity. Baumol(1967) pointed out that the growth rate of productivity in service industry is slower compared with manufacturing, thus the cost of services increased substantially, resulting in the proportion of the services sector in GDP increased dramatically.

3) Service outsourcing. Fixler and Siegel (1999) pointed out that the growth of the service industry is an important reason that the original in-house production of service activities are externalized and become an independent industrial sector.

These three explanations are all supported by empirical researches. However, recent studies have shown that, producer service as intermediate inputs is the main source of growth in service industries. For example, according to the data of financial, telecommunications, business services (FCB) industries of some OECD countries , Guerrieri and Meliciani (2005) pointed out that from the mid-1970s to the 1990s, the final demand of FCB industry grew only 1.0 percent annually, but an average annual growth rate in intermediary demand high up 5.12 percent.

The significance in the development of producer service is the positive impact of other industries of national economy, especially the manufacturing sector. UNCTAD believed that the service industry is associated with other economic activities, so it has far-reaching implications on the country's economic performance.

Riddle pointed out that business revolution is the prelude and pioneer to industry, and service innovation has become the support of the industrial revolution. For example, the emergence of professional research activities, improving the educational system, the mode of transport and the emergence of financial innovation provide a solid foundation for the industrial revolution. Therefore, Riddle proposed, the increase in share of services is not the result of economic growth, but the reason for economic growth. Here, UNCTAD and Riddle obviously refer to producer service.

2. The Effects of Producer Service on Manufacturing

Production of the impact of the services sector to the manufacturing sector is an extensive discussion on the existing problems. Traditional theory related to the service and manufacturing sector is the development of the turn. Economic development followed the evolution of industrial structure, secondary and tertiary industries step by step transfer of stairs. From the industrialized development stage, it has undergone several stages of the following: (1) the pre-industrial era. During this period, the primary industry accounted for a dominant position, the secondary industry has developed to a certain extent, the status of the tertiary industry minimal. (2) The early industrialization. During this period, the value of the primary industry in the proportion of the national economy gradually decreases, the declining status of the second industry to greater development of industries from light industry-oriented focus on gradually shift the basis of industry-dominating, the secondary industry dominates. Thirdly there is a certain industrial development, but the proportion in the national economy is still relatively small. (3) medium-term industrialization. During this period, the focus from basic industries to high processing industry in transition, the secondary industry remained No. 1, and the tertiary industry increased gradually. (4) Post-industrialization. During this period, the proportion of secondary industry continues to decline, and the rapid development of the tertiary industry, the fastest growth of the information industry, the proportion of the tertiary industry output in the three industries in the dominant position, and even has an absolute dominance. (5) Post-industrial period, at this stage, the main characteristics of knowledge-based industries.

Since the 1970s, the rapid development of the service industry caused people to rethink the relationship between services and manufacturing. As Rowthorn and Wells(1987) feels that the manufacturing sector is prerequisite for the development of services and infrastructure, the manufacturing sector added to services, many of the services sector's development must rely on the development of the manufacturing sector; manufacturing output of the service industry is an important sector demand. If there is no manufacturing, there would almost be no demand for such services. Pappas feels that the production of services to improve the productivity of the manufacturing sector is the prerequisite and basis for the production of under-developed services sector, can not form a strong competitiveness of the manufacturing sector, through deepening labor specialization or reduce the manufacturing sector into the middle of the cost of services such as channels, the expansion of the services sector will enable the manufacturing sector receipts, and constantly raise the level of professionalism, promote labor productivity increase is the driving force. Park feels that the services and manufacturing sector for the performance of interaction, interdependence and common development of the complementary relationship.

With the enhancement of economic development, the degree of services and manufacturing rely much on each other. On one hand, the production of services depends on the development of manufacturing sector. Most of the production of services is supporting production activities, a considerable proportion of their output is the production of the manufacturing sector in the middle demand, the development of the manufacturing industry, it lost the source of demand; On the other hand, from the benign development of the manufacturing sector is not Production of the strong support services, production services to improve manufacturing productivity and value-added products. Production of professional development, strengthening the production and operation of enterprises in vertical and horizontal linkages strengthened and deepened their mutual dependence and increase the financial, transportation, communications, advertising, consulting and maintenance, and other services. Therefore, the efficient production of services is in the manufacturing sector, raising labor productivity; enhance the competitiveness of products and the protection of the premise. In addition, Economic Geography studies show that the production of the service sector to manufacturing industries has an important impact on the layout. Marrewijk and Stibora(1997) and other studies show that the manufacturing sector of a country's international competitive advantage not only determined by factor endowments, but also determined by the level of development of the service industry.

At the micro level, many researches have found that manufacturer and producer service provider depend on each other in many aspects. Outsourcing Association of the United States has made a summary, see Table 1. In this analytical framework, the basic tactical advantage is the ability to reflect, is a core strategic advantage of the ability to reflect, and revolutionary advantage can be regarded as advantages of dynamic capabilities.

Insert Table 1 Here

3. An Empirical Research

3.1 Assumptions

Empirical research, related to the influence of manufacture resulted from product-service industry, currently

concentrated mainly in the manufacturing efficiency (output per capita), the international competitiveness of the manufacturing sector (exports), and other indicators like that (Kevin O'Connor, 1996). Here we choose the increasing data rate as a measure of indicators. That is because product-service industry and manufacturing industries are in the different countries and regions and what we care most is the occupying rate of each country which is so-called increasing data rate.

Theoretically speaking, product-service industry contribute much to the development of the manufacturing industries and it can increase the rate of manufacture which is called ”industry-related effect ”as follows, but there are two issues we should not neglect:

Fist, product-service industries mainly refers to the knowledge and technology intensive industries, and therefore the production got higher returns. However, the relatively pure manufacturing sector is capital and labor-intensive industries, and therefore we got low returns. Shi put forward the famous "smile curve” theory based on the computer industry, see Figure1. In the value chain, the proportion of manufacturing sector is lower than before, while the proportion of producer service industries is growing.

Second, from a statistical point of view, the manufacturing enterprises provide internal support services sector, including the value created in the manufacturing enterprise. If manufacturers outsource production services, the manufacturing sector will be as intermediate inputs and did not enter the manufacturing value added. As a result, manufacturing value added declined called "statistical effect." With the production of the service industry outsourcing more and more prevalent and with the value of the transfer and the role of statistical effect, the creation of the value of the manufacturing sector may also decline.

Therefore we have the following two assumptions:

H_1: More outsourcing of producer services leads to lower rate of value-added manufacturing, which means value transfer and statistical effects in excess of correlative effect among industries

H_2: The more Outsourcing of producer services, the higher the rate of manufacturing value-added, which means correlative effect among industries in excess of the transfer of value and statistical effects.

Insert Figure 1 Here

3.2 Model and Data

There are two standards in defining producer services In Empirical Research. One is defined by the type of industry, such as financial services, logistics, business services, research and development, and real estate, and so on. The advantage of this way is that data are easy to collect. But the problem is that some of these industries also provide personal and consumer services, just like personal financial services and residential real estate, making the data not accurate. The other definition follows strictly to producer services: Being the non-ultimate consumer services for intermediate inputs, this service should be a producer service whichever specific service it belongs to. Though being accurate, this approach depends on the input-output table when getting data. And, we must adopt value-type input-output tables instead of physical-type, dues to the difficulty in calculating services. For statistical techniques constraints, input-output tables generally lag behind the release of a number of years, and input-output tables are not made every year in many countries.

This article adopts the second approach, analyzing the impact that producer services have in manufacturing value creating on the basis of input-output tables. Input-output tables are from the Organization for Economic Cooperation and Development (OECD), the official statistics of its member states and important non-member countries or regions.

Establish the model of Empirical Analysis:

$$AO_{ik} = \alpha_{ik} + \beta SI_{ik} + u_{ik} \,. \tag{1}$$

AO_{ik} is added-value rate of i industry in country k (equals to the proportion of added-value in total industrial output); SI_{ik} is the country k 's intermediate inputs of manufacturing sector ,there is also the proportion of producer service in all intermediate inputs:

$$SI_{ik} = \frac{\sum_{j=1}^{m} I_{jik}}{\sum_{j=1}^{n} I_{jik}} \tag{2}$$

Which I_{jikt} is the intermediate input of j industry sector to i manufacturing sector in country k ,There are a total

of n as input of industry sectors, among them the services sector number is m; According to the OECD statistics framework, n=40 (Sectors No. 1 ~ 40),m=14 (Industry Sectors No. 27 ~ 40).

OECD statistics in selected manufacturing integrity of the system a total of eight countries, they are China, Czech Republic, France, Japan, South Korea, Norway, the United Kingdom and the United States. In the OECD reunification of the input-output tables, the manufacturing sector, a total of 22 (Industry Sectors No.3 ~ 24), which are: food and beverages tobacco industry, textile, wood products manufacturing, paper products and printing industrial, coal, coke, oil refining and nuclear fuel industries, chemical products (excluding drugs) industry, pharmaceutical manufacturing, rubber, plastics manufacturing, other non-metal manufacturing, iron and steel industry, non-ferrous metal manufacturing, metal component manufacturing, machinery equipment manufacturing, stationery manufacturing, electrical equipment manufacturing industry, radio and television communications equipment manufacturing, medical, precision and optical equipment manufacturing, automobile manufacturing, shipbuilding and ship-repairing industry, aerospace industry, railways and transport equipment manufacturing industry, manufacturing recovery. Therefore Total 22 × 8 = 176 sample points.

This model is similar to the popular panel data model. The regression output is represented as both fixed effects model (Table 2) and random effects model (Table 3).

Insert Table 2, Table 3 Here

Therefore, even if effected by the value transfer and the statistical system, the Producer Services was separated from the manufacturing sector. That means the manufacturing sector is not simply to production services, and then transferred directly to the value of downstream manufacturers or ultimate consumers; production services companies and manufacturing enterprises cooperation, and promote the upgrading of the manufacturing sector, thereby creating greater value.

4. Policy Implications

China is a large manufacturing power in the world, but most of Chinese manufacturing enterprises are in the position of being governed in the world Value Chain. There are two different opinions over the years: Some people think that we should stick to developing the manufacturing industry in order to contribute to Industrial upgrading and Transmission. While others think that we should give service industry priority to increase the proportion of the service industry.

However, Producer Services have their particularity. For example, it asks for more strategic elements (such as human capital and entrepreneurship), and it gives more attention to the protection of Intellectual Property, so the development of the service industry still has a long way to go.

This paper indicate that, for most areas in China , in order to realize the upgrading of the manufacturing industry, on one hand Chinese enterprises should focus on making sure the leading position of manufacturing industry, on the other hand, building up their core competency in R&D and marketing through cooperation with upper and down session.

Therefore, for most areas of China, the industrial policy is not focusing on the development of local service industry by leaps and bounds, but on the promotion between local manufacturing industry and advanced foreign Producer Services enterprises so as to accelerate the pace for the upgrading of manufacturing industry. With this in mind, the improvement of manufacturing industry brings a great demand for Producer Services, which is bound to contribute to the development of local producer services in the long run.

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Table 1. Advantages of service outsourcing

Tactical advantage	Strategic advantage	Changing advantage
Reduce and control operating costs	Improve business concerns	Bring to customers faster, newer solutions
Reduction of non-core business investments	Access to world-class advanced technology	The increasingly shorter product life cycle to respond
Cash injection	Promote reorganization	Re-established with suppliers and partners relations
Lack of access to internal resources	Risk-sharing	Ahead of rivals
Overcome difficulties in control and management functions	Release resources for other purposes	To lower the risk of entering a new market

Table 2. Regression of Fixed Effects Model

Variable	Coefficient	t-Statistic
SI?	0.564941	7.938917
Fixed Effects		
CHN--C	0.211894	
CZE--C	0.128524	
FRA--C	0.169262	
JPN--C	0.222284	
KOR--C	0.193042	
NOR--C	0.133580	
UK--C	0.185649	
USA--C	0.247275	
R-squared	0.503482	
Adjusted R-squared	0.479697	

Table 3. Regression of Random Effects Model

Variable	Coefficient	t-Statistic
C	0.187095	8.105900
SI?	0.562275	8.228406
Random Effects		
CHN--C	0.022701	
CZE--C	-0.052432	
FRA--C	-0.015454	
JPN--C	0.032443	
KOR--C	0.005848	
NOR--C	-0.047556	
UK--C	-0.000561	
USA--C	0.055011	
R-squared	0.485586	
Adjusted R-squared	0.482629	

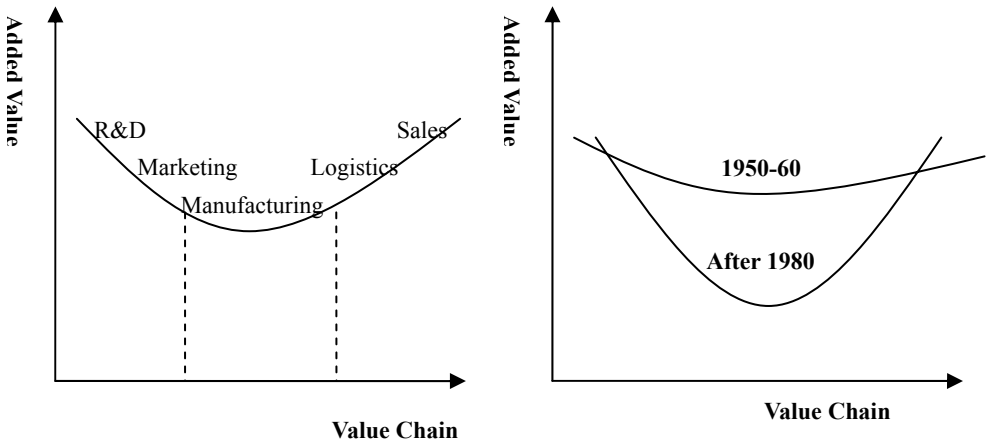

Figure 1. Smiling Curve

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Interactions between Monetary Policy and Exchange Rate in Inflation Targeting Emerging Countries: The Case of Three East Asian Countries

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Abstract

This paper investigates empirically how the reaction of monetary policy to exchange rate has changed after the adoption of inflation targeting regime in three East-Asian countries. Using a system equation of structural VAR and a single equation approaches, this paper shows that the reactions of monetary policy to exchange rate shocks as well as CPI (demand shocks) and output (supply shocks) have declined under the inflation targeting environment. The policy function reacts weakly to the exchange rate movements before and after the financial crisis of 1997 in two out of the three countries. These central banks react differently to inflation. Empirical estimations of policy reaction functions indicate that the policy maker in Philippines pays higher concerns on output gap stability in the post-crisis period although Philippines has implemented the inflation targeting regime.

Keywords: Exchange rate, Inflation targeting, Policy reaction function

1. Introduction

Although the role of exchange rate in the setup of monetary policy in emerging market is no longer new in the international macroeconomics literatures, it still remains as a hot topic for debates among researchers. The research on the design of monetary policy rule before was based on the case of closed economy. For example, in the simple Taylor rule, interest rate as the policy instrument is a weighted function of inflation and output gap. This rule does not give a direct role to the exchange rate.

However, in the real world, economies are quite open and the exchange rate movements can be matter in the design of monetary policy. Many studies suggest the inclusion of exchange rate term in the policy reaction function and show that exchange rate plays an improving role in the performances of monetary policy rules and enhances higher welfare of agents (for examples Ball (1999), Batini et.al (2001) and Senay (2001)). Exchange rate contributes to the demand channel through the effects of relative price (foreign and domestic goods) and creates the direct exchange rate channel through the convert of domestic currency prices of foreign produced goods. It affects the aggregate demand for domestic goods (Senay, 2001).

On the other hand, there are opinions which against this view. There are arguments that central banks should concern the effects of exchange rate fluctuations on inflation and output gap rather than giving an independence role for the exchange rate in the policy reaction (Mishkin (2000) and Schmidt-Hebbel (2002)). The reasons are exchange rate already has the indirect effects on inflation and output in the policy reaction function. Giving a direct role to exchange rate in the Taylor rule may add volatility to the monetary policy (Taylor, 2001).

This paper extends the studies on the role of exchange rate in the monetary policy reaction under the inflation targeting environment in three inflation targeting East-Asian countries. It seeks to investigate the relationship between monetary policy and exchange rate from two perspectives: the impulse response of monetary policy to exchange rate shocks and the responses of monetary policy to exchange rate movements. Two approaches are applied in this study, i.e the system equation approach of structural VAR and the single equation of GMM. First, using the system equation of structural VAR approach, this study seeks to investigate how the monetary policy responds to the exchange rate disturbances/ shocks before and after the adoption of inflation targeting regime. How large the effect of exchange rate shocks is accounted for in the forecast error variances decomposition for monetary policy as compare to the other shocks? Second, using the single equation of GMM, this study seeks to estimate the coefficients of the policy reaction function with respect to the policy targets such as output gap and inflation as compare to that of exchange rate between the two sub-periods. Through this estimation, one can observe how does the policy react to the exchange rate shocks and movements and how does the reaction change between the two sub-periods.

The main findings of this study are the responses of monetary policy to shocks including the exchange rate shocks have declined in the post-crisis period. At the same time, the price or inflation shocks can explain higher forecast errors of monetary policy relative to other shocks. The policy makers in these countries react differently to exchange rate

movements and inflation variable. With the exception of Thailand, the policy reaction functions in Korea and Philippines do not react significantly to the exchange rate movements in the two sub-periods. The results imply that central banks in these countries do not follow as what they have claimed. Although these countries have implemented the inflation targeting after the financial crisis, only Thailand shows a significance reaction of monetary policy to the inflation variable. The policy maker in Philippines pays higher concerns on output gap stability after the crisis.

The remainder of the paper proceeds as follows. Section two reviews the literature on the relationship between monetary policy and the exchange rate. Section three is about the data. Section four discusses the methodologies. Section five discusses the results. Section six concludes.

2. The issue of exchange rate in emerging countries – some reviews

There are numerous empirical studies that investigate the relationship between monetary policy and exchange rate. In general, the main literatures that address the relationship between the exchange rate and the monetary policy can be divided into three categories. The first category examines the change in the degree of exchange rate pass-through after the adoption of inflation targeting or compares the pass-through rate in inflation targeting and non inflation targeting countries. The second category investigates and compares the results of the volatility of exchange rate in inflation targeting and non inflation targeting countries. The third category examines the responses of the monetary policy to the exchange rate movements before and after the adoption of inflation targeting regime.

The research in the exchange rate pass-through shows that exchange rate and monetary policy are correlated to each other. Many studies show that exchange rate pass-through in emerging countries is higher than that in the developed countries. Therefore, it is argued that emerging countries face higher difficulties in their efforts to target at low inflation rate and maintain price stability (Minella et.al, 2003, Fraga, 2003 and Nogueira Junior, 2007). However, a number of studies show that the pass-through rate has declined in many countries and researchers have different explanations for that. One of the famous explanations is that low pass-through rate correlates with low inflation rate as a consequence of strong commitment towards price stability by Taylor (2000). The view of Taylor is supported by many empirical studies such as Edwards (2006), Gagnon and Ihrig (2004) and Nogueira Junior (2007).

The inter-relationship between exchange rate and monetary policy can also be captured through the volatility in exchange rate. Emerging countries tend to pay greater concerns on achieving the exchange rate stability than that of developed countries do as they have lower credibility to control the low inflation rate. It is argued that the inflation targeting countries should float the exchange rate for the proper implementation of this regime due to the theory of 'Impossibility of the Holy Trinity' where the capital mobility and the monetary policy independence cannot be achieved under the pegged or fixed exchange rate regime (Mishkin & Savastano (2001)). As mentioned in Mishkin (2004), controlling the exchange rate movements may generate two risks, i.e the risk of transforming the exchange rate into a nominal anchor that takes over the inflation target and the risk where the movements of exchange rate may depend on the nature of shocks. Therefore arguably, the inflation targeting countries may experience higher exchange rate volatility. However, some empirical studies show that this hypothesis does not hold (for example, Edwards (2006)).

The role of exchange rate in the design of monetary policy rules is another way to study the relationship of exchange rate and monetary policy. The results from the empirical studies are quite controversial. By estimating the Taylor rule type policy rules, Mohanty & Klau (2004) show that in most of the emerging countries, the monetary policy responds to exchange rate strongly. Frömmel & Schobert (2006) estimate simple Taylor type policy rules for six Central and Eastern European countries. They find that exchange rate plays an important role in the monetary policy during the fixed exchange rate regimes periods. However, the influence disappears after these countries have moved to the flexible regimes. On the other hand, Osawa (2006) in his study on three Asian inflation targeting countries finds no evidence of monetary policy responds to the exchange rate. He argues that the reason for this difference result is because the existing studies do not consider structural breaks of data in their estimations. Besides, including the crisis period in the sample of estimation may overestimate the response of monetary policy to exchange rate. This paper conducts the analysis within this category.

2.1 Exchange rate regimes and monetary policy in Asian

The financial crisis of 1997 and 1998 in East-Asian countries has totally changed the monetary policies and exchange rate regimes in these countries. According to the International Monetary Financial (IMF) classifications, Korea has moved from managed floating to independently floating regime after the crisis. Thailand on the other hand, has moved from pegged exchange rate to managed floating regime while Philippines remains the same regime as independently floating after the crisis (see Table 1). The move from rigidity to more flexible regimes give some effects on the volatility of exchange rate, foreign exchange reserves and the interest rate (see Table 2). In general, the change in the regimes leads to higher fluctuations in exchange rate in three East-Asian countries considered in this study. However, the foreign exchange reserves and interest rate have declined in all three countries after the crisis.

Besides moving to the more flexible exchange rate regimes, these Asian countries also alter their monetary policy and adopt the inflation targeting regime after the financial crisis of 1997. Korea was the first country in East-Asian that has adopted the inflation targeting regime, i.e in April 1998. Thailand followed the step in May 2000 and later Philippines in January 2002 (Osawa, 2006). For more detail on the monetary policy framework in these countries, see Table 1.

Officially, these countries are moving to more flexible exchange rate regimes and these central banks claim that they do not consider a direct role for the exchange rate in their policy reaction functions in the post-crisis period. Do the central banks in these countries follow as what they have claimed? How large the effect of exchange rate in the policy reaction function and how does the role of exchange rate change in the pre- and post-crisis periods (or after the switch of policy regimes) in these countries? These are all the main focus of this paper.

3. Data

This study focuses on the three crisis-hit East-Asian countries that have moved from the rigid exchange rate regime to the flexible one and inflation targeting regime after the crisis namely Korea, Philippines and Thailand. These countries have adopted the inflation targeting regime at different time. i.e Korea in April 1998, Thailand in May 2000 and Philippines in January 2002. For the purpose of this study, the data is divided into two sub-periods referring to the starting year of the adoption of inflation targeting regime. The full sample series are from 1990M1 to 2007M5. Period I indicates the pre-crisis period or the period before the adoption of inflation targeting. It spans from the beginning of 1990 to 1997M6 (Note 1). Period II represents the post-crisis period and the starting period of the adoption of inflation targeting regime. The range is different across countries. Korea takes the range of 2000M1 to 2007M5, Philippines 2002M1 to 2007M5 and Thailand 2000M5 to 2007M5 (Note 2).

This study uses two sets of data. The first set of data is used to estimate the system equation of SVAR models while the second set of data is used to estimate the GMM single equation model. The data are in monthly and are obtained from the International Financial Statistics (IFS), IMF. The first set of data consists of money demand or M1 (M), bilateral nominal national local currency per USD exchange rate (EX), consumer price index (CPI), industrial/ manufacturing production index (IP), the oil price of the world (OIL), money market rate or short-term interest rate (I) and Federal Fund rate (FFR). All the series are in logarithm form except the interest rate. The construction of the data and the representation of the variables are explained in Table 3(a). All the data are tested with the unit-root tests and are transformed into the stationary form before conducting the estimations (see Table 4).

The second set of the data consist of short term interest rate (I), output gap (GAP), annually inflation rate (PI) and the growth rate of exchange rate (see Table 3(b)). The output gap is defined as the deviation of log industrial production index from its HP filtered trend series. The annual rate of inflation is constructed as the log current CPI deviates from the log 12th lagged of CPI. The change in exchange rate is constructed as the log differenced of exchange rate series from its one lagged term.

The single equation approach of GMM is applied using the second data set and periods as defined above. However, due to the data availability problem and the structure of the system equation, the estimation of the SVAR model may take a slightly different time paths defined above (refer Table 5).

4. Methodology

This study applies two different approaches namely the structural VAR and the single equation based on Generalized Method of Moments (GMM). Using a structural VAR approach, this paper seeks to investigate the effects of exchange rate shocks to monetary policy. In the second part, a single equation based on GMM is used to estimate the responses of policy reaction function to exchange rate movements.

4.1 SVAR

This study takes the ideas and modifies the structural VAR model in Kim (2003) and Kim & Roubini (2000) that identifies the exogenous policy shocks and policy reaction functions. Following Kim (2003) and Kim & Roubini (2000), the economy can be described as:

$$G(L)y_t = e_t \tag{1}$$

G(L) represents a matrix in the lag operator L, y_t is the (n x 1) vector and e_t is an (n x 1) disturbance vector with variance var(e_t)= Λ and Λ is a diagonal matrix. The general reduced form of VAR equation takes the form of:

$$y_t = B(L)y_{t-1} + u_t \tag{2}$$

where B(L) is a matrix of lag operator and $\text{var}(u_t) = \Sigma$.

As discussed in Kim (2003), there are different ways to recover the parameters in the structural form equation from the reduced form equation. One of the methods is the so-called generalized method. This method assigns restrictions on the contemporaneous structural parameters and allows non-recursive structures.

$$B(L) = -G_0^{-1}G^0(L) \tag{3}$$

where $G^0(L)$ is the coefficient matrix without the contemporaneous coefficient G^0. Given that $\Sigma = G_0^{-1}\Lambda G_0^{-1}$ and Σ contains n(n+1)/2 parameters, we need at least n(n-1)/2 restrictions on G^0 (for further detailed explanations, see Kim (2003)).

In this study, seven variables are included in the VAR model. These variables are interest rate (I), monetary aggregate or M1 (M), consumer price index (CPI), output (IP), world price of oil in terms of the US Dollar (OIL), Federal funds Rate of the US (FFR) and the exchange rate as units of US Dollar (EX). Therefore, the vector of stationary endogenous variables can be written as:

$$y_t = \begin{bmatrix} I_t & M_t & CPI_t & IP_t & OIL_t & FFR_t & EX_t \end{bmatrix}'$$

The first four variables are the variables used in the standard international macroeconomics model or monetary business cycle model. Following Kim & Roubini (2000), FFR and OIL have the function of isolating 'exogenous' monetary changes. As discussed in Kim & Roubini (2000), the recession and price inflation in the economy can be due to the monetary contraction and original supply shocks. Therefore, in order to identify the shocks due to the monetary policy alone, the oil price index is used as a proxy for inflationary supply shocks. FFR is used to control for the component of domestic monetary policy that react to the foreign monetary policy shocks. Finally, nominal exchange rate is used as to investigate the reaction of monetary policy to the exchange rate shocks in the small open economies.

All the series are in log form (except the interest rate series) in order to capture the percentage change in the variables. Applying the unit-root test of Augmented Dicky Fuller (ADF) and Schmidt Phillips (SP) to the two sub-periods sample shows that in most cases, these variables are not stationary in their levels. As discussed in Ramaswamy and Sloek (1997), there are three ways to specify the non-stationary series in a VAR system, i.e either to specify the series in differenced form, specify them in levels or consider the cointegration relationships among the variables under consideration by applying a vector error correction model (VECM). VECM is considered when the cointegration relationship is known. However, if the relationship is unknown, VECM can be biased and it could be more appropriate to consider the VAR in levels. This paper applies a structural VAR model in differenced form in order to generate efficient estimators (Note 3). The length of lag is determined by referring to the optimum lag suggested by Akaike Info Criterion, Final Prediction Error and Schwarz Criterion and by checking the fulfillment of diagnostic tests. A constant term and seasonal dummies are included in the model (Note 4).

As in Kim & Roubini (2000), the restrictions on the contemporaneous structural parameters can be written as follows (Note 5):

$$\begin{bmatrix} e_t^I \\ e_t^M \\ e_t^{CPI} \\ e_t^{IP} \\ e_t^{OIL} \\ e_t^{FFR} \\ e_t^{EX} \end{bmatrix} = \begin{bmatrix} 1 & 0 & G_{13} & G_{14} & G_{15} & 0 & G_{17} \\ G_{21} & 1 & G_{23} & G_{24} & 0 & 0 & 0 \\ 0 & 0 & 1 & G_{34} & G_{35} & 0 & 0 \\ 0 & 0 & 0 & 1 & G_{45} & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & G_{65} & 1 & 0 \\ G_{71} & G_{72} & G_{73} & G_{74} & G_{75} & G_{76} & 1 \end{bmatrix} \begin{bmatrix} u_t^I \\ u_t^M \\ u_t^{CPI} \\ u_t^{IP} \\ u_t^{OIL} \\ u_t^{FFR} \\ u_t^{EX} \end{bmatrix}$$

where G represents the values of non-restrictions; zero restrictions are assigned on the contemporaneous structural parameters. The structural disturbances (left hand side) represent the shocks of interest rate, money aggregate, consumer price index, output, oil price, foreign monetary policy and exchange rate respectively. The 'u' terms in the right hand side are the residuals in the reduced form which can be interpreted as unexpected movements of variables in the system equation.

Apart from the original restriction used by Kim & Roubini (2000) that apply to the G-7 countries, this paper modifies the restriction on the monetary policy reaction function. In this paper, the monetary policy reaction function is assumed to follow a Taylor rule type equation i.e the interest rate reacts to CPI (price level), IP (output) and EX (exchange rate). As in Kim & Roubini (2000), the exchange rate and the oil price variables are included in the monetary reaction function in order to control the current responses of monetary policy to the state of the economy.

Apart from this, the second reason to include the exchange rate terms in the policy reaction function is to capture the reaction of interest rate (monetary policy) to this variable over time in the small open economies environment. In order to investigate how significance the role of exchange rate in the monetary policy, I first allow the interest rate policy reacts to the exchange rate (model I) and later restrict the reaction to zero (model II), i.e B(1,7)=0.

The other six equations follow the restrictions or identifications as in Kim & Roubini (2000). The second equation is the money demand function that depends on the real income (CPI and IP) and the opportunity cost of holding money (nominal interest rate). The third equation is the CPI inflation equation that assumed to respond to the output and inflationary pressure of the world's oil price. The output is a function of inflationary pressure of oil price variable.

Following Kim & Roubini (2000), the oil price is assumed to affect prices and the real sector contemporaneously. The foreign monetary policy reacts to the oil inflationary pressure shocks. The exchange rate equation represents the financial market equilibrium and receives the contemporaneous effects of all variables in this model.

As explained in Kim & Roubini (2000), the first two equations represent the money market equilibrium, the third and forth equations describe the domestic goods market equilibrium, the fifth and sixth equations as exogenous shocks from the foreign countries and the last equation describes the exchange rate market.

4.2 Generalized Method of Moments – Monetary policy reaction function

In the second approach, this study applies Generalized Method of Moments technique in estimating the monetary policy reaction function. Following Mohanty and Klau (2004) and Osawa (2006), the monetary policy reaction function takes the form of:

$$i_t = \alpha_0 + \alpha_1 \pi_t + \alpha_2 GAP_t + \alpha_3 \Delta E_t + \alpha_4 \Delta E_{t-1} + \alpha_5 i_{t-1} \quad (4)$$

$$i_t = \alpha_0 + \alpha_1 \pi_t + \alpha_2 GAP_t + \alpha_5 i_{t-1} \quad (5)$$

where i is the interest rate policy reaction function; π is the inflation rate target and GAP is the output gap target; E is the log exchange rate target and Δ denotes the first differenced operator. The lag term of interest rate acts as the smoothing term. As discussed in Osawa (2006), $\alpha_1 > 1$ indicates that the central bank attempts to stabilize the inflation. If $\alpha_1 < 1$, the increase in nominal interest rate is lower than the real interest rate to fully offset the increase in the inflation shocks. According to Mohanty and Klau (2004), $\alpha_3 > 0$ and $\alpha_4 \gtrless 0$. α_4 can be positive or negative because the exchange rate is assumed to be mean reverting (Note 6). Equation (4) is the policy reaction function which reacts to exchange rate movements but equation (5) does not. Both policy reaction functions are estimated separately using the data of the two sub-periods for the three inflation targeting Asian countries (Note 7).

5. Results

5.1 Results - SVAR

The results of SVAR are based on the contemporaneous coefficients in the SVAR models, the impulse response functions and the forecast error variance decompositions. The results give us the effects of disturbances or economic shocks on the variables in the system and the reactions of variables to shocks.

Estimating the SVAR models that include and exclude the exchange rate term do not give very different results except the case of period I (pre-crisis period) in Korea and period II (post-crisis period) in Thailand. In the case of Korea in period I, excluding the exchange rate term in the SVAR model gives more reasonable results of impulse response functions. Conversely, in the case of period II in Thailand, excluding the exchange rate term in the model does not give the right reaction of CPI in response to the monetary policy shocks as predicted by theories. The results suggest that the policy reaction function in Korea before the crisis may not react significantly to exchange rate term. On the other hand, the policy reaction in Thailand after the crisis may react to exchange rate term. For the other cases where no very different results with and without exchange rate term in the model, the results suggest that the exchange rate term does not have significance effects on the policy reaction functions or the policy reaction functions may not react significantly or strongly to the exchange rate term.

The following discussions are based on the results of the coefficients of SVAR, impulse response function and forecast error variance decomposition. As discussed above, the results of including and excluding the exchange rate term in the model do not change very much, this paper only displays the results that include the exchange rate term (model I) with the exception of Korea in period I.

The results of SVAR are checked with diagnostic tests, i.e the tests for autocorrelation, conditional heteroskedasticity and non-normality (see Table 5). In most cases, the tests are not able to reject the hypothesis of no autocorrelation, no heteroskedasticity and non-normality at 5% significance level. The presence of non-normality may due to the unavoidable very short series of data used in the analysis.

Table 6 summarizes the results of estimated coefficients. Consistent to the results reported in Kim & Roubini (2000), the estimated values of G13, G14, G15 and G17 are negative in most cases, implying a contractionary policy in response to the inflationary pressures. The coefficient for G13 is larger relative to the other coefficients, implying that the central banks in these countries are concerned about the inflation or price stability. On the other hand, the estimated coefficient of G17 is relatively smaller (with the exception of Thailand), implying that the reaction of policy reaction function to exchange rate is relatively small. In Thailand, the policy reaction function is strongly impacted by the exchange rate shocks. In all cases, the likelihood ratio test show that the identifying restrictions are not significant at the significance level.

The results of the impulse response function (IRF) for model I are summarized in Table 9(a-c). The middle line represents the responses while the upper and lower dashed lines are two standard error bands. In general, the reactions

of the domestic variables to a one percent monetary policy shocks are consistent as predicted by the economic theories. The monetary policy interest rate shocks lead to the increase in interest rate, but the decline in M1, CPI and appreciation in exchange rate.

Apart from the effects of monetary policy shocks, the reactions of monetary policy interest rate to domestic shocks are also observed and summarized in Table 9(c). The increase in CPI (demand shock) and output growth (supply shock) as well as the depreciation in exchange rate (exchange rate shock) lead to the increase in interest rate. In the case of period II in Korea, the increase in interest rate is followed by its decline afterwards. In Thailand, the increase in output growth does not followed by the tightened in interest rate.

Table 7 reports the results of numerical values of impulse response functions of monetary policy interest rate to the inflation, output growth and exchange rate shocks. In general, the magnitudes of the change in the policy reaction in response to the domestic shocks (CPI, output and exchange rate) have declined after the financial crisis of 1997. These results do not necessary mean that the policy reaction functions in these countries do not react to these three shocks but it could be due to the decline on the effects of the shocks or lower persistency of shocks in period II (after the recovering from the crisis).

Although the effects of these three shocks have declined over time, the results of the forecast error variance decomposition (FEVD) show that the maximum explanatory power of CPI or inflation shocks on the forecast error variance of the policy reaction function in these three East-Asian countries has increased after the adoption of inflation targeting (see Table 8). This implies greater concerns of the authorities on price stability. On the other hand, the maximum determination power of exchange rate on policy reaction function remains low in Korea and Philippines but increases sharply in Thailand from at most 3% to at most 43% or at a mode of 24% in period II. Thailand adopted the fixed exchange rate regime before the financial crisis of 1997-98 but has switched to the floating regime and inflation targeting after the financial crisis. The switch from the fixed regime to the flexible one means exchange rate is allowed to fluctuate freely which generates higher volatility in the exchange rate or greater exchange rate shocks.

5.2 Results – GMM

Using the Generalized Method of Moments approach, equation (4) and (5) are estimated for the two sub-periods. The instruments variables consist of one to four lags of output gap, inflation, interest rate and nominal exchange rate (Note 8). Therefore, the number of overidentifying restrictions for equation (4) and equation (5) are 12 and 14 respectively. The chi-square of overidenfying restrictions at 5% significance level are 21.0 and 23.7 respectively. In all cases, the sizes of sample (adjusted for the degree of freedom) multiply with J values are smaller than the values of chi-square, i.e the overidentifying restrictions cannot reject at the 5% significance level. The results are summarized in Table 11 and 12 below. The results of GMM give us the ideas on how the policy reaction functions react to the economic variables over time. As in the SVAR approach, excluding the exchange rate term in the policy reaction function does not change much the results. On the other hand, the policy reaction functions in all the three countries react significantly to the interest rate smoothing term.

Table 11 summarizes the results of policy reaction coefficients. It is observed that Thailand is the only country where the monetary policy reacts to exchange rate (EX) in the pre- and post-crisis periods. Thailand is also the only country that follows the Taylor Principle, i.e the long-run coefficient for the policy responds to inflation exceeds unity or $(\alpha_1 / 1-\alpha_5) > 1$. The central bank in Thailand raises the real interest rate higher than the nominal interest rate in response to the increase in inflation rate. The policy reaction functions in the other two countries namely Korea and Philippines do not react significantly to the exchange rate (EX) term.

Comparing the results before and after the crisis, it is observed that the policy reaction equation of (4) and (5) fit the data very well in the post-crisis period or after the implementation of inflation targeting regime where the short-term interest rate is used as the policy instrument. Before the implementation of inflation targeting regime, the equations fit badly the data in Philippines. The results also show that the policy makers react differently to inflation. The policy makers in Korea and Thailand are concerned about the inflation or price stability. Philippines although has implemented the inflation targeting regime, the policy reaction function in Philippines does not react significantly to the inflation variable but reacts strongly to the output gap in period II. In Korea, the policy reaction function reacts significantly to inflation in both sub-periods. However, the coefficient of inflation in the policy reaction function is very small and closed to zero in period II. The same results also reported in Osawa (2006). According to Osawa (2006), the low response of BOK (Bank of Korea) to inflation does not necessarily imply the failure of inflation targeting regime in Korea but it can be interpreted as the achievement of low inflation in Korea induced by inflation targeting regime. Hence there is low response of monetary policy to inflation in Korea in period II. This condition can be observed from the line graph.

Table 10 shows the line graphs of short-term interest rate and annually inflation rate for these three countries. As observed in Korea, the inflation rate is lower and more stable in period II. The interest rate in period II is constant in

responds to lower inflation environment. In Thailand, there is a co-movement of inflation and interest rate and inflation rate gains stability after the implementation of inflation targeting regime. In Philippines, the interest rate does not react accordingly to control the fluctuations in inflation rate. There is no significance improvement in the inflation rate.

Table 12 shows the estimated results of policy reaction functions that exclude the exchange rate terms. Excluding the exchange rate terms in the policy reaction function does not affect the policy reactions to other variables in the equation in all cases. Excluding the exchange rate term (EX) in the policy reaction function even generates higher R-square and lower standard error in Korea and Philippines. On the other hand, since the monetary policy in Thailand reacts to exchange rate term (EX) strongly in period I, excluding the exchange rate term in the policy reaction function gives lower R-square and higher standard error in period I. However, excluding the exchange rate term in period II in Thailand generates better fit of data. In general, the results of GMM are consistent to the results of SVAR, i.e the policy reaction functions in Korea and Philippines do not react significantly to exchange rate directly in both sub-periods and there is a strong response of policy reaction function in Thailand to exchange rate movements in the pre-crisis period.

6. Conclusion

Economists and researchers have different opinions on the role of exchange rate in the design of monetary policy in emerging market. The move of exchange rate regime from rigid to flexible and inflation targeting induces more debates on the relationship between monetary policy and exchange rate. Researchers have different explanations on the decline of the degree of exchange rate pass-through and the lower relationship between the monetary policy and exchange rate variables under the inflation targeting environment. While some researchers explain this as the contribution of the positive effects of inflation targeting, others refer this as the result of foreign exchange intervention. They argue that the lower correlation between monetary policy and exchange rate variables does not mean that there is no role for exchange rate in the design of policy rule but this may due to the intervention activity.

Applying a structural VAR and GMM approaches, this paper seeks to find out the answer on the relationship between the monetary policy and exchange rate in three East-Asian countries that have moved to the inflation targeting regime after the financial crisis of 1997-98. In particular, this paper seeks to compare the result before and after the change to more flexible exchange rate regimes and the adoption of inflation targeting regime. Applying a SVAR approach to investigate the response of policy reaction function to exchange rate shocks, the results of impulse response functions show that the responses of interest rate to domestic variables shocks (as well as exchange rate shock) have declined. Although the price level is less volatile and more stable (as well as other variables), the relative explanatory power of CPI shocks on monetary policy has increased after the adoption of inflation targeting regime. The explanatory power of exchange rate shocks on the other hand, remains low in two out of three countries in this study.

Consistent to the results reported in SVAR models, the results of GMM show that the policy reaction function in two East-Asian countries react weakly to the exchange rate movements. In both approaches, excluding the exchange rate term in the policy reaction function does not generate large changes in the policy reaction function with the exception of Thailand in period II. This is because the policy function does not show a significance response to the exchange rate movements directly. However, this does not mean that the exchange rate does not play a role in the monetary policy in these countries. The exchange rate may influence the movements of policy reaction function indirectly through its effects on the domestic variables such as inflation and output gap. On the other hand, the central bank may react to the exchange rate movements through intervention in the foreign exchange market as argued in many studies (for example Osawa (2006), Disyatat & Galati (2005)).

The estimated results also imply that the central banks in these countries do not follow what they have claimed. For example, Philippines although has implemented the inflation targeting regime, the policy reaction function in Philippines does not react significantly to the inflation variable but reacts strongly to the output gap in period II. There is an evidence of the policy reaction responds directly to the exchange rate terms in the post-crisis period.

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Notes

Note 1. The data for pre-crisis period used in SVAR analysis is mentioned in Table I(4), Appendix I. The data for the pre-crisis period used in GMM analysis spans from 1990M5 to 1997M6.

Note 2. Korea officially adopted the headline CPI inflation targeting regime in April 1998 and later switched to core CPI in January 2000 (Osawa, 2006).

Note3. Transforming the series in differenced may ignore the long-run relationships of variables. However, the main focus of this paper is to investigate the responses of short-run interest rate policy to inflation, output and exchange rate.

Note4. Impulse dummy is considered in case significant impulse or break of series is detected/ suggested by the unit-root with structural break test.

Note5. In this study, I only consider the stationary variables, however as discussed in Breitung et. al (2004), the SVAR modeling can use the variables fitted to the levels ignoring the unit-root and cointegration resctrictions to avoid imposing too many restrictions.

Note 6. The conditions hold based on the bilateral nominal exchange rate of USD against domestic currency.

Note 7. The instrument variables include the constant and one to four lags on all the endogenous variables.

Note 8. In Philippines, the nominal bilateral exchange rate and the nominal effective exchange rate of lag one and two are included as instrument variables in addition to the instrument variables as in Korea and Thailand.

Appendix

Table 1. Monetary Policy Framework

No	Countries	Monetary Policy Framework
1	Korea	Three main periods: Monetary targeting Since 1957, M1 was pre-announced quarterly or yearly as a macroeconomics policy In 1979, monetary target changed to a M2 growth rate till mid 1990s After crisis 1997-98, accepted IMF rescue financing plan, used M3 as reference value of monetary base, at the same time, adopted inflation targeting (two pillar system) In 2001, monitored M3 growth and the monitoring ended in 2003 with a pure inflation targeting Interest rate as an operational target After 1997-98, the interest rate was accepted as an operational target. Since 1999, Monetary Policy Committee (MPC) announced the target call rate for interest rate. Inflation targeting Since 2000, core CPI inflation rate has been chosen as the benchmark inflation indicator. The target rate is determined annually with the range of +/-1%. Official exchange rate regimes: March 1980-October 1997----Managed floating November 1997-present----Independently floating
2	Philippines	Two periods: Monetary targeting In the past, monetary policy framework based on base or reserve money programming. Inflation targeting (2002 onwards) Inflation targeting policy adopted officially in January 2000 and the implementation started in January 2002. CPI or headline inflation is used as its monetary policy target and overnight repurchase rate and reverse repurchase rate are used as the main instrument of monetary policy. Official exchange rate regimes: January 1988-present----Independently floating
3	Thailand	Three main periods: Pegged exchange rate regime (2nd World War-June 1997) The value of Baht was pegged to a major currency/ gold or to a basket of currencies Monetary targeting regime (July 1997-May 2000) Beginning the periods of floating exchange rate. Received assistance from IMF, targeted at domestic money supply. Set daily and quarterly monetary base targets. Inflation targeting regime (May 2000-present) Inflation targeting is more effective as the relationship between money supply and output growth was becoming less stable after financial crisis. Official exchange rate regimes: January 1970-June 1997-----fixed July 1997-present----Independently floating

Sources: Hernandez & Montiel (2001), IMF & BIS

Table 2. Volatility of Exchange Rate, Foreign Exchange Reserves and Interest Rate

	Korea		Philippines		Thailand	
	Pre-crisis	**Post-crisis**	**Pre-crisis**	**Post-crisis**	**Pre-crisis**	**Post-crisis**
Exchange rate	0.70	2.18	2.21	2.28	0.46	1.95
Foreign exchange reserves	3.59	1.88	12.42	3.43	2.65	2.22
Interest rate	1.07	0.60	1.46	0.89	1.39	0.75

Notes: Crisis periods are defined as November 1997 to April 1998 for Korea, and July 1997 to April 1998 for Thailand and Philippines. Pre-crisis and post-crisis are defined as before and after the crisis period for each country

Source: Osawa (2006)

Table 3(a). List of Series, Definitions and Data sources for SVAR

No.	Variables	Data	Sources
1	Logarithms of Nominal exchange rate (EX) Korea Philippines Thailand	Logarithms of Bilateral exchange rate of national currency per US Dollar.	International Financial Statistics (IFS), IMF
2	Level of interest rate (I) Korea Philippines Thailand	Money market rate	International Financial Statistics (IFS), IMF
3	Logarithms of Consumer Price Index (CPI) Korea Philippines Thailand	Logarithms of Consumer Price Index	International Financial Statistics (IFS), IMF
4	Logarithms of money demand (M) Korea Philippines Thailand	Logarithms of M1	International Financial Statistics (IFS), IMF and OECD dataset
5	Output (IP) Korea Philippines Thailand	Logarithms of industrial production index; Thailand uses logarithms in GDP	International Financial Statistics (IFS), IMF and BOT
6	Federal Fund Rate (FFR)	Level of U.S Federal Fund Rate	International Financial Statistics (IFS), IMF
7	The oil price of the world (OIL)	Logarithms of world's oil price in USD	International Financial Statistics (IFS), IMF

Table 3(b). List of Series, Definitions and Data sources for GMM

No.	Variables	Definitions	Sources
1	Interest rate	Money market rate	International Financial Statistics (IFS), IMF
2	Inflation (annual)	$\left[(cpi_t - cpi_{t-12})/cpi_{t-12}\right]$	International Financial Statistics (IFS), IMF
3	Output gap	Log differenced of industrial production index from its HP filter trend series	International Financial Statistics (IFS), IMF
4	Growth in exchange rate	Log differenced of exchange rate from its first lagged term	International Financial Statistics (IFS), IMF

Table 4. Unit-root Test for Stationarity

Countries	Variables	Period I		Period II	
		ADF	SP	ADF	SP
Korea	cpi	-3.3311*	-1.4531	-2.8168	-3.3256***
	dcpi	-6.2544***	-6.3056***	-7.6000***	-7.1676***
	ex	-1.4323	-1.0312	-2.7569	-1.4241
	dex	-3.7609***	-5.8706***	-4.5170***	-7.5151***
	ip	-5.1666***	-5.8275***	-5.6817***	-7.6071***
	dip	-10.0004***	-9.9964***	-8.8114***	-13.0901***
	i	-3.3909*	-3.0344**	-1.2414	-1.4410
	di	-6.0716***	-8.9032***	-3.7599***	-5.4840***
	m	-1.5036	-1.0335	-0.3119	-1.6578
	dm	-5.9502***	-6.9428***	-2.7503*	-3.7149***
Philippines	cpi	-2.6873	-1.5936	-1.5210	-1.3460
	dcpi	-4.5714***	-4.8487***	-4.9629***	-6.5703***
	ex	-3.3279*	-1.7709	-1.6341	-1.3213
	dex	-5.0201***	-9.7624***	-3.8535***	-9.8971***
	ip	-2.8921	-5.7595***	-3.1840*	-4.5800***
	dip	-8.5704***	-10.9489***	-6.3263***	-10.5865***
	i	-4.6807***	-6.8402***	-2.2392	-2.0671
	di	-8.5805***	-11.5418***	-5.3103***	-5.9204***
	m	-3.9118**	4.6786***	-1.5513	-2.3199
	dm	-7.8396***	-9.8818***	-6.7730***	-3.1082**
Thailand	cpi	-1.9359	-2.2179	-1.4798	-1.5117
	dcpi	-5.8941***	-6.5645***	-4.5008***	-6.8421***
	ex	-2.1144	-2.3002	-3.2142*	-1.5767
	dex	-4.5419***	-7.1378***	-4.0105***	-8.2006***
	ip	-4.2741***	-5.2168***	-3.1506*	-8.6148***
	dip	-6.6303***	-14.2456***	-8.5779***	-12.3351***
	i	-2.5067	-3.2967**	-3.1270	-2.4393
	di	-6.7255***	-8.4554***	-4.6891***	-5.0977***
	m	-3.6285**	-2.1545	-0.9260	-1.8921
	dm	-5.0753***	-4.7797***	-4.7022***	-3.4082**
U.S	ffr	-1.9534	-0.8631	-1.6172	-1.0438
	dffr	-2.4857	-5.7729***	-2.2359	-2.7507
	ddffr	-6.8503***	-14.1540***	-7.2317***	8.6900***
	oil	-3.6711**	-3.2326**	-2.1468	-1.9390
	doil	-5.3089***	-6.0117***	-5.9282***	-8.8306***

Notes: *** denotes the significant statistic at 1% level

** denotes the significant statistic at 5% level

* denotes the significant statistic at 10% level

“d” denotes the first differenced on the original series

All the variables are in logarithm form except “ ffr and i

ADF denotes Augmented Dicky FullerTest and SP denotes Schmidt PhillipsTest; the specifications for ADF consist of 2 lags, constant and trend for all level of variables and constant and 2 lags for differenced variables.

Table 5. Model Specifications and Diagnostic Test for SVAR

Test	Korea		Philippines		Thailand	
	Period I	**Period II**	**Period I**	**Period II**	**Period I**	**Period II**
Test for Autocorrelation						
Portmanteau Test	671.1281	691.4877	855.0112	726.9652	845.7450	687.5960
	(0.6198)	(0.6447)	(0.2663)	(0.4516)	(0.4765)	(0.2882)
Test for Non-normality						
Doornik & Hansen:						
Joint t-stat	15.8140	17.0212	28.2335	50.9652	19.9706	9.2254
	(0.3249)	(0.2550)	(0.0132)	(0.0000)	(0.1311)	(0.8163)
Skewness only	8.7576	12.0228	14.7040	14.9014	9.6279	7.1064
	(0.2705)	(0.0998)	(0.0400)	(0.0377)	(0.2107)	(0.4179)
Kurtosis only	7.0565	4.9984	13.5295	36.0639	10.3427	2.1190
	(0.4230)	(0.6602)	(0.0602)	(0.0000)	(0.1700)	(0.9530)
Test for Conditional Heteroskedasticity						
ARCH-LM Test						
u1	14.6828	10.4000	6.0016	14.0076	9.8723	14.951
	(0.5480)	(0.8449)	(0.9881)	(0.5982)	(0.8732)	(0.5279)
u2	8.8440	19.0078	8.9711	8.6384	9.4439	16.3431
	(0.9197)	(0.2683)	(0.9146)	(0.9276)	(0.8940)	(0.4293)
u3	12.7476	24.4074	15.5181	10.6626	13.6724	12.2567
	(0.6911)	(0.0810)	(0.4871)	(0.8298)	(0.6231)	(0.7259)
u4	17.7327	7.4283	20.5765	8.5830	10.3828	10.2767
	(0.3398)	(0.9641)	(0.1954)	(0.9296)	(0.8459)	(0.8518)
u5	15.9075	7.8549	8.2195	9.4193	5.9364	15.1230
	(0.4594)	(0.9531)	(0.9421)	(0.8951)	(0.9888)	(0.5156)
u6	14.6469	9.6358	10.8995	11.5924	15.9281	9.8401
	(0.5506)	(0.8849)	(0.8156)	(0.7715)	(0.4580)	(0.8748)
u7	16.7558	7.6755	25.3313	15.3974	10.8397	13.5417
	(0.4016)	(0.9579)	(0.6242)	(0.4958)	(0.8793)	(0.6328)
Specifications	C, S, T, 5 lags	C,S,T, 4 lags, imp01m10, Imp05m11	S,C,T, 3 lags, Imp90m8	C, S, 3 lags, imp02m11, Imp04m6	C,S, T, 2 lags, imp90m8	C,S, 5 lags
Samples	1991M1-1997M4	2000M1-2007M5	1989M6-1997M6	2001M6-2007M2	1990M1-1997M6	2000M5-2006M12

Notes:

The upper numbers are the t-statistics and the parentheses values are the p-values. Most of the numbers are not significant at 5% level and cannot reject the null hypothesis of no autocorrelation, normality and no conditional heteroskedasticity with the exception of Philippines due to short series.

C denotes the constant, S is seasonal dummies and T is trend.

Table 6. Estimated coefficients for SVAR

	Period I			Period II		
	Korea	**Philippines**	**Thailand**	**Korea**	**Philippines**	**Thailand**
G13	-64.0135	-46.8214	-12.3383	**0.2126**	-38.0754	-55.6241
	(71.3225)	(99.9663)	(74.7000)	(4.7981)	(14.1206)	(76.5138)
G14	2.0925	-25.5912	20.8797	-0.6398	-0.0754	-7.5323
	(5.6228)	(13.0309)	(10.3171)	(0.3479)	(0.9993)	(12.6054)
G15	5.9585	-6.0239	-9.9200	-0.0474	0.6095	-2.7306
	(2.7856)	(7.5734)	(5.8617)	(0.1257)	(0.7694)	(3.1083)
G17	-	-11.6141	-88.4873	-0.7507	-4.8488	-72.2476
	-	(111.4808)	(250.5432)	(2.5363)	(13.8029)	(99.5841)
G21	0.0036	0.0011	0.0013	0.0157	-0.0004	-0.1132
	(0.0006)	(0.0006)	(0.0013)	(0.0127)	(0.0057)	(0.0453)
G23	0.3964	-0.8687	-0.0110	0.4068	0.5259	0.3906
	(0.3474)	(0.3682)	(0.7671)	(0.3303)	(0.6445)	(0.8887)
G24	0.0513	0.0320	0.0824-	-0.0624	0.0618	-0.3442
	(0.0287)	(0.0456)	(0.1128)	(0.0310)	(0.0403)	(0.1299)
G34	-0.0088	0.0234	-0.0054	-0.0096	0.0034	-0.0050
	(0.0093)	(0.0120)	(0.6150)	(0.0093)	(0.0079)	(0.0176)
G35	-0.0117	0.0125	0.0058	-0.0134	-0.0056	-0.0137
	(0.0044)	(0.0083)	(0.0058)	(0.0033)	(0.0043)	(0.0055)
G45	-0.0119	0.0990	0.0121	0.0464	0.1310	0.0034
	(0.0564)	(0.0700)	(0.0409)	(0.0389)	(0.0620)	(0.0361)
G65	-0.0044	-0.3686	-0.4211	-0.2884	-0.0027	-0.1813
	(0.2504)	(0.2068)	(0.2355)	(0.1985)	(0.2047)	(0.1912)
G71	-0.0013	0.0011	0.0013	0.0488	0.0229	1.0929
	(0.0008)	(0.0019)	(0.0011)	(0.1646)	(0.0229)	(2.2988)
G72	-0.3139	-0.2184	0.0080	0.2973	-0.0080	5.4647
	(0.1348)	(0.1051)	(0.0194)	(0.3074)	(0.1109)	(11.5603)
G73	0.3374	-0.2097	0.1214	1.3063	-0.9679	-6.0908
	(0.4191)	(0.3978)	(0.1382)	(0.9938)	(1.0487)	(15.2043)
G74	-0.0581	0.0218	0.0443	0.0057	-0.0286	-0.2246
	(0.0333)	(0.0653)	(0.0307)	(0.1323)	(0.0388)	(1.1748)
G75	-0.0338	-0.0125	0.0106	0.0100	-0.0320	-1.2572
	(0.0167)	(0.0331)	(0.0115)	(0.0325)	(0.227	(2.7098)
G76	0.0048	0.0333	-0.0074	-0.0256	(0.0117)	-0.3830
	(0.0073)	(0.0149)	(0.0034)	(0.0161)		(0.8119)
LR test						
$\chi 2$	9.1301	3.6474	1.3820	2.4459	4.3851	1.5489
probability	0.1040	0.4558	0.8473	0.6544	0.3564	0.8179

Note: The number of over-identified variables is 4 in all cases but 5 in the case of Thailand in period I. The values in parentheses are the standard errors

Table 7. Impulse response functions: effects of shocks on monetary policy

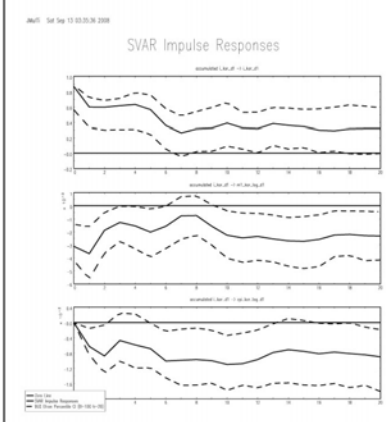
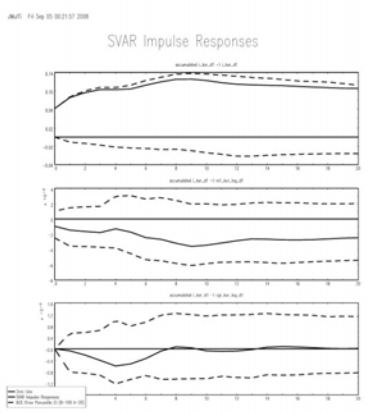
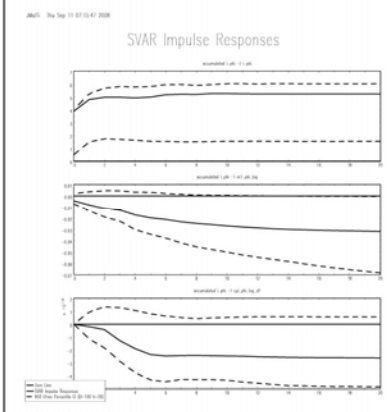
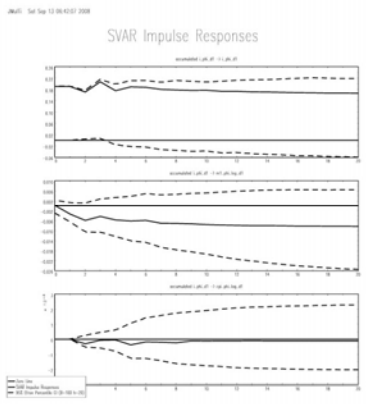
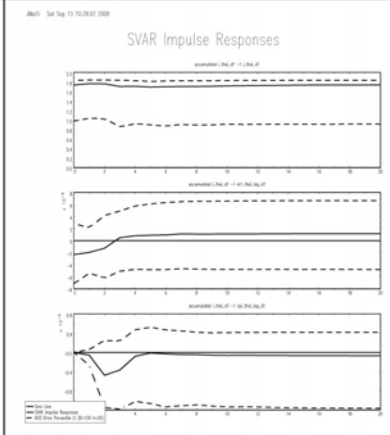
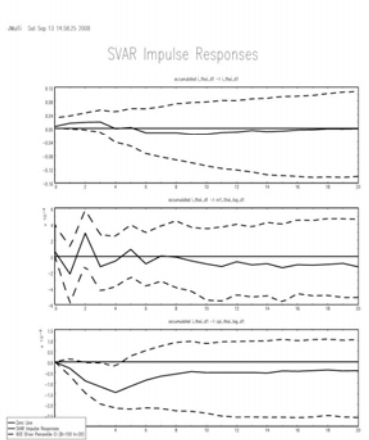
Shocks	**Periods**	**Korea**		**Philippines**		**Thailand**	
		I	**II**	**I**	**II**	**I**	**II**
CPI	1	0.0637	0.0077	0.1339	0.0687	0.0040	0.0260
	4	0.1015	-0.0223	0.3135	0.1111	0.0358	0.0627
	8	0.1678	-0.0327	0.1513	0.1498	0.0226	0.1330
	12	0.1659	-0.0287	0.1725	0.1649	0.0308	0.1574
	16	0.1794	-0.0234	0.3234	0.1712	0.0281	0.1608
	20	0.2039	-0.0212	0.4814	0.1750	0.0280	0.1597
Output gap	1	0.1677	0.0169	0.7828	0.0016	-0.4633	-0.0001
	4	0.0676	0.0185	0.9805	0.0207	-0.3983	-0.0217
	8	0.1820	0.0027	0.3632	0.0233	-0.3727	-0.0486
	12	0.1310	-0.0066	0.4399	0.0265	-0.3391	-0.0583
	16	0.2214	-0.0102	0.7381	0.0284	-0.3225	-0.0458
	20	0.3018	-0.0099	0.5474	0.0288	-0.3117	-0.0515
Exchange rate	1	0.0000	0.0221	-0.6454	0.0371	0.3183	0.0613
	4	0.0855	0.0046	-0.8560	0.8327	0.3581	0.0981
	8	0.3608	-0.0053	-1.0736	0.0940	0.3560	0.1164
	12	0.4519	-0.0171	-0.7889	0.0911	0.3503	0.1177
	16	0.5294	-0.0141	-1.0492	0.0889	0.3433	0.1225
	20	0.5972	-0.0140	-0.9833	0.0874	0.3404	0.1266

Table 8. FEVD: Maximum effects of shocks on monetary policy

Shocks	Korea		Philippines		Thailand	
	I	II	I	II	I	II
I	0.94	0.86	0.94	0.85	0.84	0.04
M	0.07	0.06	0.00	0.03	0.02	0.30
CPI	0.02	0.03	0.01	0.11	0.00	0.17
IP	0.06	0.11	0.07	0.03	0.06	0.08
OIL	0.11	0.07	0.02	0.13	0.07	0.28
FFR	0.08	0.04	0.01	0.01	0.07	0.06
EX	0.03	0.02	0.04	0.04	0.03	0.43

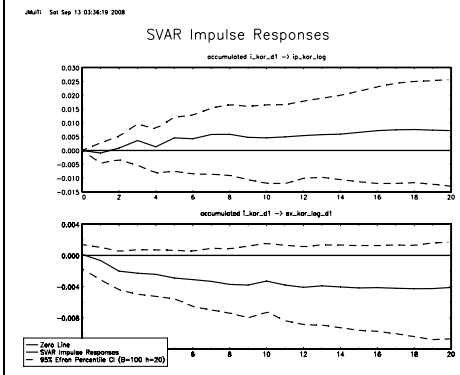
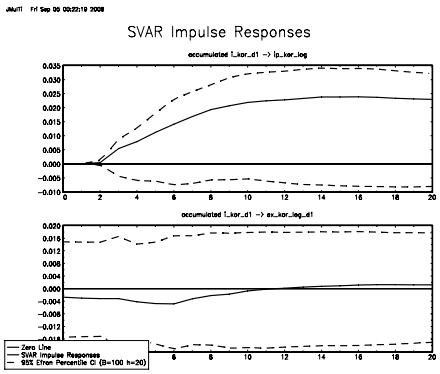
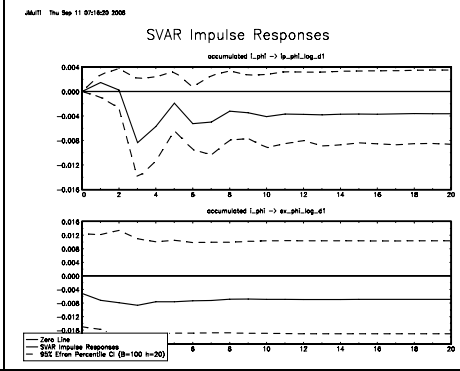
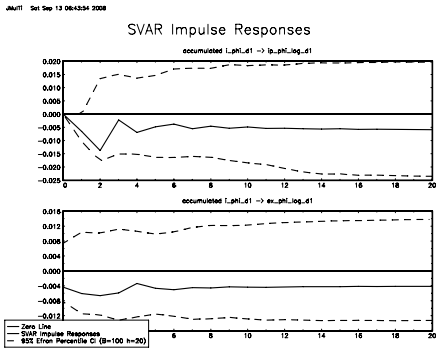
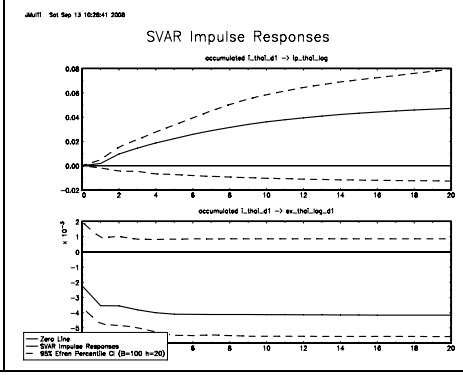
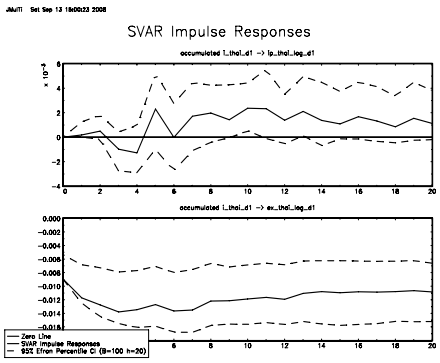
Notes: The maximum effects of shocks (in percentage) are obtained from FEVD generated by running the SVAR models.

Table 9(a). IRF:Effects of monetary policy on I, M and CPI

	Period I	Period II
Korea		
Philippines		
Thailand		

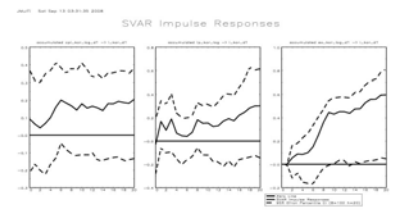
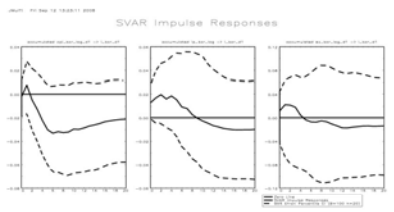
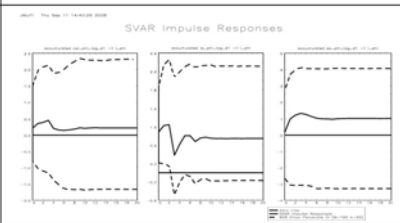
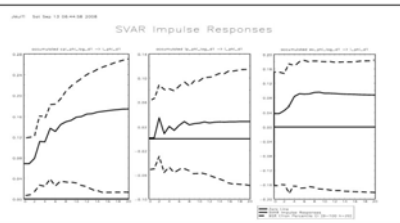
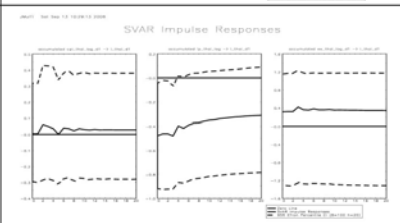
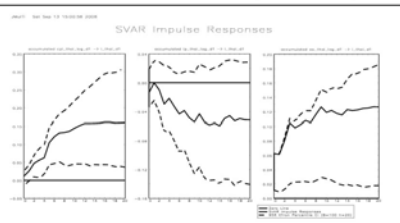
Notes: The figures show the effects of domestic monetary policy on I, m and CPI from the top to down ordering M denotes the monetary aggregate, I denotes the interest rate and EX is the exchange rate

Table 9(b). IRF: effects of monetary policy shocks on IP and EX

	Period I	**Period II**
Korea		
Philippines		
Thailand		

Notes:The figures show the effects of domestic monetary policy on GAP, and EX from the top to down ordering IP denotes the output, ex denotes nominal exchange rate

Table 9(c). IRF: the responses of monetary policy to IP, CPI and EX shocks

	Period I	Period II
Korea		
Philippines		
Thailand		

Notes:The figures show the impulses of CPI, IP and EX on monetary policy from the left to right ordering

Table 10. Interest rate and inflation rate (1990M5-2007M5)

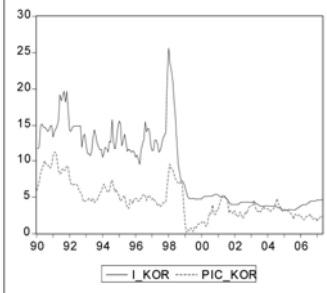
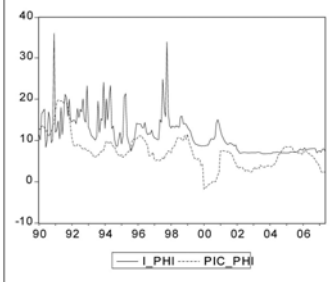
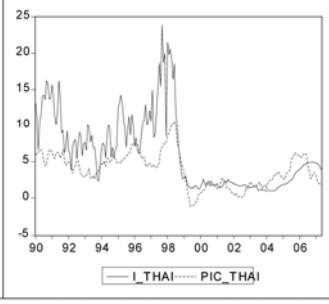
Countries	Graphs
Korea	
Philippines	
Thailand	

Table 11. Estimated of simple rule with exchange rate terms

Countries	Period	Pie	Gap	I(-1)	de	de(-1)	Std. error	J-stat	R^2
Korea	I	0.2035***	0.0547	0.6268***	0.2465	-0.0182	0.0122	0.0885	0.7174
	II	-0.0247***	0.0049*	0.9941***	-0.0056	0.0017	0.0009	0.0615	0.9778
Philippines	I	0.1618*	-0893	0.3644***	0.0354	-0.1078	0.0467	0.0946	0.0076
	II	-0.0063	0.0267***	0.5198***	-0.0507	-0.0167	0.0027	0.1201	0.5700
Thailand	I	0.2460	0.0121	0.7924***	-1.5285***	0.7733**	0.0206	0.1021	0.6233
	II	0.0745***	-0.0001	0.9474***	-0.0567***	0.0188	0.0021	0.0864	0.9721

Notes:
*** denotes the significant level at 1% interval
** denotes the significant level at 5% interval
* denotes the significant level at 10% interval
Chi-square (12)=21.0

Table 12. Simple rule without exchange rate terms

Countries	Period	Pie	Gap	I(-1)	S.E	J-stat	R^2
Korea	Period I	0.2045***	0.0551	0.6641***	0.0121	0.0898	0.7148
	Period II	-0.0246***	0.0040	0.9962***	0.0009	0.0618	0.9781
Philippines	Period I	0.1847**	0.1111	0.3384***	0.0454	0.0935	0.0376
	Period II	0.0023	0.0231***	0.6040***	0.0026	0.1374	0.6000
Thailand	Period I	0.4453**	-0.0450	0.6925***	0.0218	0.1338	0.5654
	Period II	0.0717***	-0.0057	0.9520***	0.0017	0.1419	0.9813

Notes: As mentioned below Table 11; Chi-square(14)=23.7

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ASEAN-5 + 3 and US Stock Markets Interdependence Before, During and After Asian Financial Crisis

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Abstract

The issues of international stock markets linkages had been investigated over the time. Since the Asian financial crisis in 1997, many economists are concerned about the relationship between Asian stock markets and others in the world. The main objective of this paper is to examine the linkages between ASEAN-5+3 namely Malaysia, Singapore, the Philippines, Thailand, Indonesia, China, Japan and Korea and US stock markets. The data consists of weekly stock indices data. The total samples are separated into three sub-periods. All the indices applied are expressed in local currencies. In conclusion, we found that ASEAN-5+3 and US stock markets are interdependence during crisis and post-crisis periods and the impact of US stock market is effective in ASEAN-5+3 stock markets only for pre- and during-crisis periods.

Keywords: Stock markets, Cointegration, Granger-causality, ASEAN

1. Introduction

Until 1997, Asia attracted almost half of the total capital inflow to developing countries. The economies of Southeast Asia in particular maintained high interest rate was attractive to foreign investors who look for a high rate of return. As a result the region's economies received a large inflow of hot money and experienced a dramatic run-up in asset prices. At the same time, the regional economies of Thailand, Malaysia, Indonesia, the Philippines, Singapore, and South Korea experienced high growth rates at 8-12%, in the late 80s and early 90s. This achievement was broadly acclaimed by economic institutions including the IMF and World Bank, and was known as part of the Asian economic miracle.

Regardless the disputed causes, the Asian crisis started in mid-1997 had affected the currencies, stock markets, and other asset prices of several Southeast Asian economies. Triggered by events in Latin America, particularly after the Mexican peso crisis of 1994, Western investors lost confidence in securities in South East Asia and began to pull money out, creating a domino effect.

At the mid of 1997, Thailand was hit by currency speculators, resulting in great damages in the financial sectors of country. What at first appeared to be local financial crisis in Thailand has escalated into a global financial crisis within few months. Initially, spreading to other Asian countries – Indonesia, Korea, Malaysia and the Philippines – then far afield to Russia and Latin America, especially Brazil. The Asian crisis, however, has turned out to be far more serious than its two predecessors in terms of the extent of contagion and the severity of resultant economic and social costs. Following the massive depreciations of local currencies, financial institutions and corporations with foreign currency debts in the afflicted countries were driven to extreme financial distress and many were forced to default.

Several factors were responsible for the onset of Asian financial crisis: a weak domestic financial system, free international capital flows, the contagion effects of changing market sentiment and inconsistent economic policies. In recent years, both developing and developed countries were encouraged to liberalize their financial markets and allow free flows of capital across countries. As Asian developing countries eagerly sourcing foreign capitals from US,

Japanese and European investors, who were attracted to these fast growing emerging markets for extra returns for their portfolios. Large inflows of private capital resulted in a credit boom in the Asian countries in the early and mid-1990s. The credit boom was often directed to speculations in real estate and stock markets as well as to investments in marginal industrial projects. Fixed or stable exchange rates also encouraged un-hedged financial transactions and excessive risk-taking by both lenders and borrowers, who were not much concerned with exchange risk.

As asset prices declined (as happened in Thailand prior to the currency crisis) in part due to the government's effort to control the overheated economy, the quality of banks' loan portfolios also declined as the same assets were held as collateral for the loans. In addition, their lending decisions were often influenced by political considerations, likely leading suboptimal allocation of resources. However, the so-called crony capitalism was not a new condition, and the East Asian economies achieved an economic miracle under the same system. Meanwhile, the booming economies with a fixed or stable nominal exchange rate inevitably brought about an appreciation of the currencies. This, in turn, resulted in a market slowdown in export growth in these Asian countries like Thailand and Korea. If the Asian currencies had been allowed to depreciate in real terms which were not possible because of the fixed nominal exchange rates, discrete changes of the exchange rates as observed in 1997 might have been avoided. In Thailand, as the run on the Baht started, the Thai central bank initially injected liquidity to the domestic financial system and tried to defend the currency by drawing on its foreign exchange reserves. With its foreign reserves declining rapidly, the central bank eventually decided to devalue the baht.

International money and capital markets have become more integrated in recent years. Many studies have been undertaken to examine the integration of international stock markets. There are several reasons that contributed to the stock market interdependences, e.g. increase in capital flows across national boundaries and potential benefits from diversification of investment on international level. It is important for the investors to diversify international portfolio if they have the knowledge on the structure of equity market linkages across countries. As a large number of investors competing to earn high returns, stock prices in different countries should closely reflect the underlying economic fundamentals. Consequently, common stochastic trends in stock markets of those countries potentially mirror their economic fundamentals that are related significantly with one another (Phengpis and Apilado, 2004). According to Kearney and Lucey (2004), with increasing integration of international equity markets, the diversification benefits will tend to decline. Lack of cointegration between the stock markets may allow investors to minimise portfolio risk by international diversification.

This study consider whether ASEAN-5+3 countries namely Malaysia, Singapore, Indonesia, Thailand the Philippines, China, Korea, Japan and US are integrated with each other because of importance of their economic as trading partners and in terms of investment flows. Both the multilateral and bilateral relationship between the individual ASEAN-5+3 and US stock market is examined through the cointegration and Granger-causality techniques. In addition, we are interested to know whether US stock market has any effect on the ASEAN-5+3 stock indices before, during and after Asian financial crisis.

2. Literature Reviews on ASEAN-5 + 3 Stock Markets Integration

Arshanapalli et al. (1995) investigate the presence of a comman stochastic trend between US and the Asian stock market movements during pre- and post-October 1987 period. They using daily data, the sample includes index data for US, Japan, Hong Kong, Malaysia, the Philippines, Singapore and Thailand for the time period January 1, 1986 through May 12, 1992. By implying cointegration and error-correction model, they find that the influence of the US stock market innovations was found to be greater during the post-October 1987 period. The results also indicate that the Asian equity markets are less integrated with Japan's equity market than they are with the US market.

Sheng and Tu (2000) analyze the linkages among national stock markets before and during the period of the Asian financial crisis by using cointegration and variance decomposition analysis to examine the linkages. The data consist of daily closing prices for the New York S&P 500 and the following 11 major Asia-Pasific equity market indices: Tokyo Nikkei 225, Hong Kong Hang-Seng, Singapore Straits Times, Sydney All Ordinaries, Seoul Composite Index, Taiwan Composite Index, Kuala Lumpur Composite Index, Manila Composite Index, Bangkok Composite Index, Jakarta Composite Index and Shanghai B-shares Index. The prices are collected for the period from July, 1 1996 to June 30, 1998. The results show that the relationship for the South-East Asian countries is stronger than that for the North-East Asian countries. The tests also show no cointegrational relationship before the period of the financial crisis. The forecast error variance decomposition also finds that the degree of exogeneity for all countries indices has been reduced.

Manning (2002) applies both the Johansen Maximum Likelihood approach and the Haldane and Hall Kalman Filter technique to consider the co-movement of equity markets in South East Asia, at the same time taking the United States to be the external market. The two samples analyzed comprise weekly and quarterly information on equity indices and US dollar series for the US, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand over the period January 1988 to February 1999. He finds that in general, there are two common trends present

in the eight Asian equity market indices modeled here, and also two trends when the US market in additionally included in Johansen VAR.

Jaag and Sul (2002) analyze the changes in the co-movement among the stock markets of the countries which have undergone the crisis directly and the neighboring Asian countries since the crisis seems to have common impact on the Asian countries as a whole. These countries are Thailand, Indonesia and Korea as direct crisis countries and Japan, Hong Kong, Singapore and Taiwan as neighbouring countries. The total sample of the study is 2 years from October 1, 1996 to September 30, 1998, which is divided into three 8-month sub periods. By using Granger Causality test and co-integration analysis, they find that before the crisis, there is almost no co-movement in the stock markets of 7 Asian countries. However, uni-directional and bi-directional linkage among Asian equity markets has increased sharply since the financial crisis in June 1997. During the 8 months of the post crisis, the strong co-movement is still found and in some cases, the linkage among Asian stock markets gets even stronger.

Azman-Saini et al. (2002) investigate whether or not causality is present among the ASEAN-5 equity markets in the long run. The weekly Morgan Stanley Composite Index (MSCI) indices obtained from the Kuala Lumpur Stock Exchange (KLSE) covering period of January 1988 to August 1999 are used in this study. The results of Granger noncausality test due to Toda and Yamamoto reveal that the Singapore equity market was not affected by other markets except by the Philippines in the long-run. This may help to explain why among the ASEAN-5 equity markets, Singapore was not badly affected by the Asian financial crisis as well as the effects of the Gulf War in August 1990. This result shows that there exist opportunities for beneficial international portfolio diversification within the context of the ASEAN-5 equity markets.

Click and Plummer (2005) investigate whether the ASEAN-5 markets are integrated or segmented using the time series technique of cointegration to extract long run relations. By using daily and weekly stock index quotes in local currencies data from July 1, 1998 through December 31, 2002. The results suggest that the ASEAN-5 stock markets are cointegrated and are thus not completely segmented by national borders. However, there is only one cointegrating vector, leaving four common trends among the five variables. Conclusion, the ASEAN-5 stock markets are integrated in the economic sense, but that integration is far from complete.

Choudhry et al. (2007) examine empirically the change(s) in the long run relationship(s) between the stock prices of eight Far East countries namely Thailand, Malaysia, Indonesia, Hong Kong, Singapore, the Philippines, South Korea and Taiwan around the Asian financial crisis of 1997-98. Further test are conduct to check the change in the influence of the Japanese and US stock markets in the Far East region before, during and after the crisis. Daily stock price indices ranging from January 1, 1988 to January 1, 2003 is used. Empirical investigation is conducted by means of rolling correlation coefficients, the Johansen multivariate cointegration method, causality test and band spectrum regression. Results show significant long-run relationship(s) and linkages between the Far East markets before, during and after the crisis. The most significant linkage and relationship are found during the crisis period. Results mostly indicate larger US influence in all periods but some evidence of increasing Japanese influence is also shown.

3. Methodology

Augmented Dickey Fuller (ADF) test was initially introduced by David Dickey and Wayner Fuller in 1979. The tests for unit root identify whether an individual series (Y_t) is stationary by running an ordinal least square (OLS) regression equation. The ADF test makes a parametic correction for higher-order correlation by assuming that the y series follow an AR (ρ) process and adjusting the test methodology where ρ is the number of lagged changes in Y_t necessary to make ε_t serially uncorrelated. Two types of Augmented Dickey Fuller regressions covered the non linear trend and linear trend element respectively as shown in equation 1 and 2.

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \sum_{i=1}^{\rho} \gamma_i \Delta Y_{t-i} + \varepsilon_t \tag{1}$$

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{\rho} \gamma_i \Delta Y_{t-i} + \varepsilon_t \tag{2}$$

where t is the time trend variable, Δ is the first-differenced operator, Y_t is the logarithm of the variable in period t, $\Delta Y_t = Y_t - Y_{t-1}$, ε_t is white noise error term, δ and β_2 are the constant parameters.

More weight was given to the Phillips-Perron unit root test as this test has been shown to be more reliable than Dickey-Fuller test in the presence of large amounts of heteroscedasticity. The PP unit root test proposed by Phillips and Perron (1988) and has an advantage as it propose a nonparametric method of controlling for higher-order serial correlation in a series. The PP unit root test is performed by conducting the following regressions:

$$Y_t = \alpha_0 + \beta_1 Y_{t-1} + \eta_t \tag{3}$$

$$Y_t = \alpha_0 + \alpha_1 t + \beta_1 Y_{t-1} + \eta_t \quad (4)$$

Formally, if two or more non-stationary time series share a common trend, then they are said to be cointegrated. The theoretical framework highlighted are expressed as following: the component of the vector $Y_t = (y_{1t}, y_{2t}, \ldots, y_{nt})'$ are considered to be cointegrated of order *d,b,* denoted $Y_t \sim CI(d,b)$ if (i) all the component Y_t are stationary after n difference, or integrated of order *d* and noted as $Y_t \sim I(d)$. (ii) presence of a vector $\beta = (\beta 1, \beta_2, \ldots, \beta_n)$ in such that linear combination $\beta Y_t = \beta_1 y_{1t} + \beta_2 y_{2t} + \ldots + \beta_n y_{nt}$ wherby the vector β is named the cointegrating vector. A few major characteristics of this model are that the cointegration relationship obtained indicates a linear combination of non-stationary variables, in which all variables must be integrated of the same order and lastly if there are *n* series of variables, there may be as many as *n*-1 linearly independent cointegrating vectors.

Johansen's (1991) cointegration test is adopted to determine whether the linear combination of the series possesses a long-run equilibrium relationship. The numbers of significant cointegrating vectors in non-stationary time series are tested by using the maximum likelihood based λ_{trace} and λ_{max} statistics introduced by Johansen (1991) and Juselius (1990). The advantage of this test is it utilises test statistic that can be used to evaluate cointegration relationship among a group of two or more variables. Therefore, it is a superior test as it can deal with two or more variables that may be more than one cointegrating vector in the system. Prior to testing for the number of significant cointgrating vectors, the likelihood ratio (LR) tests are performed to determine the lag length of the vector autoregressive system. In the Johansen procedure, following a vector autoregressive (VAR) model, it involves the identification of rank of the *n* X *n* matrix ∏ in the specification given by:

$$\Delta Y_t = \delta_0 + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \Pi Y_{t-k} + \varepsilon_t \quad (5)$$

where Y_t is a column vector of the *n* variables, Δ is the difference operator, Γ and ∏ are the coefficient matrices, *k* denotes the lag length and δ is a constant. In the absence of cointegrating vector, ∏ is a singular matric, which means that the cointegrating vector rank is equal to zero. On the other hand, in a cointgrated scenario, the rank of ∏ could be anywhere between zero. In other words, the Johansen Cointegration test can determine the number of cointegrating equation and this number is named the *cointegrating rank*. The Johansen Maximum likelihood test provides a test for the rank of ∏, namely the trace test (λ_{trace}) and the maximum eigenvalue test (λ_{max}). Firstly, the λ_{trace} statistic test whether the number of cointegrating vector is zero or one. Then, the λ_{max} statistics test whether a single cointegration equation is sufficient or if two are required. Both test statistics are given as follows:

$$\lambda_{trace}(r, r+1) = -T \sum_{i=r+1}^{\rho} \ln(1 - \hat{\lambda}) \quad (6)$$

$$\lambda_{trace}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (7)$$

where ρ is the number of separate series to be analysed, T is the number of usable observations and λ is the estimated eigenvalues obtained from the (i+1) x (i+1) cointegrating matrix.

4. Data

The data set consists of the weekly stock markets for ASEAN-5+3 and US stock markets covering the period from 1st January 1990 to 31st May 2007. The stock markets are Jakarta SE Composite (Indonesia), Kuala Lumpur Composite Index (Malaysia), Straits Times Index (Singapore), Bangkok SET (Thailand), Philippines SE Composite (Philippines), Nikkei 225 Stock Average (Japan), Kospi Composite Index (Korea), Shanghai SE Composite Index (China) and Dow Jones Industrial Average Index (US). All stock markets are denominated in local currencies. The analysis of data is divided into three sample periods: (Note 1) first, pre-crisis period spanning from 1st January 1990 to 30th June 1997; second, crisis-period from 1st July 1997 to 30th June 1998; and third, post-crisis period from 1st July 1998 to 31st May 2007.

5. Empirical Results

For one to proceed with cointegration tests, it is important to first examine the univariate properties of the individual time series. Notably, Johansen-Juselius cointegration procedure requires that all variables are *I(1)*. As reported in Table 1, all series are non-stationary in their level form since the null hypothesis of unit root fail to be rejected at conventional significant level except for Japan at the pre-crisis period. For during-crisis period and post-crisis period, stock indices of ASEAN-5+3 and US are stationary after first differences, that is integrated of first order and thereby implying a clear *I(1)* process. The confirmation of *I(1)* process has provided a requisite for the forthcoming cointegration analysis.

Test of cointegration has been quite a standard means of investigating long-run stationary relationship between non-stationary variables. Two or more non-stationary time series are cointegrated if a linear combination of these is stationary. Table 2 presents the cointegration tests results for the pre-crisis (part A), crisis (part B) and post-crisis (part C) periods. For each period, cointegration tests are conducted on two models: the first model includes all the ASEAN-5 with China, Korea and Japan in the VAR and in the second model the US stock index is added in the VAR. In this way,

the second model check for the presence of the US index in the long-run relationship between the stock indices of the ASEAN-5 with China, Korea and Japan: before, during and after financial crisis.

For the pre-crisis period in Table 2 (part A), both the trace test and maximum eigenvalues statistics in model 1 failed to reject the null hypothesis of no cointegrating vector. Thus, the first result from the pre-crisis period is failed to show any possible significant long-run stationary relationships between the ASEAN-5 with Korea (excluding Japan due to its stationary properties and China due to lack of data). This result change when US index is added in model 2. Trace test show two significant vectors whereas maximum eigenvalues test show only one significant vector. Therefore, since both test agreed upon one significant vector, this may imply that US is a crucial element in the cointegrating vector(s) and would indicate interdependence among these ASEAN-5 and Korea stock markets with the larger market of US during the pre-crisis period. All the eigenvalues in all the tests are less than unity, implying that the system as a whole is stable.

Results from the crisis period are shown in Table 2 (part B). Once again, two models are tested. In the first model (ASEAN-5 with China, Korea and Japan), the trace test indicates three vectors whereas maximum eigenvalues indicates two vectors at 1% significant level. Thus, result shows two stationary long-run relationships between the ASEAN-5 with China, Korea and Japan stock indices. (Note 2) In the second model, when US is added in the VAR, both trace test and maximum eigenvalues test indicate six vectors and three vectors at 1% significant level. As compared to pre-crisis period, the number of cointegrating vector increased from 1 to 3. This indicates an increase in the degree of linkages of these stock markets. According to Ratanapakorn and Sharma (2002), globalization increased during the Asian crisis and the larger number of long run relationship during the period may be due to increased globalization of the stock markets. They also find evidence of increased linkages between the markets during the crisis period. Larger number of cointegrating vectors implies that during the crisis period diversification and portfolio risk management may not reduce risk by much. Also, including the US index may not help in reducing the risk of the portfolio. Most previous studies also find significant linkages between the Asian stock markets during the crisis. Once again, eigenvalues in all tests are less than unity.

Table 2 (part C) presents the post-crisis results. Both the trace and maximum eigenvalues statistics for model 1 and 2 show that only one significant cointegrating vector exists. Thus, during the post-crisis period, only one stationary long-run relationship is found between the ASEAN-5 with China, Korea and Japan with or without the US index in the VAR. The number of cointegrating vector had decreased if we compared to during-crisis period. This decrease in the degree of linkages of these markets could be due to specific risks, such as liquidity, political, economic policy and currency risk, and macroeconomic instability in the region. All these factors may have discouraged foreign investors and lowered the globalization in the region.

Comparing the cointegration results between the three periods, the results indicate that stationary long-run relationships existed among the stock indices. (Note 3) For all three sub-periods, more nonzero cointegration vectors are found during the crisis period. Higher number of nonzero cointegration vectors (lower number of common trends) implies that diversification and minimizing portfolio risk by investors was harder during the crisis period compared to other periods. In addition, the results show that the relationships between the stock indices of the region did not change much before the Asian crisis and after it. Common stochastic trends in stock markets of those countries potentially mirror their economic fundamentals that are related significantly with one another. Overall, based on cointegration results, the inclusion of the US index in a portfolio of ASEAN-5 with China, Korea and Japan markets may not help to reduce portfolio risk.

The next step would be identifying the direction of causality among these ASEAN-5+3 and US stock markets. Granger causality tests based on VECM for pre-crisis period are conducted and the results are reported in Table 3. For Singapore, Korea and the Philippines, the error correction terms (ECTs) are negative and statistically significant at 95% significance level. The temporal causality effect are active, consequently, these three countries are endogenously determined in the model and share the burden of short-run adjustment to long run equilibrium. The temporal Granger-causality channels are abstracted from Table 3 and summarized in Figure 1. There are unidirectional causal effect running from Thailand to Indonesia and Indonesia to US before the risk spread to other countries. Changes in the Philippines and Malaysia stock market is being led by changes in US stock market. From Figure 1, it's clearly show that when the Asian financial crisis in 1997 started in Thailand, this crisis spread to Indonesia, Malaysia and the Philippines.

During-crisis period, the results in Table 2 (part B), for the second model indicates that there are three significant cointegrating vectors among ASEAN-5, China, Korea, Japan and US stock markets. Table 4 reports the results of Granger causality test based on VECM for these nine markets. With regard to ECTs, our discussion will focus only on negative and significant ECTs within the three ECTs. China is the only stock market which had negative significant ECTs without mixture with positive significant ECTs. Therefore, China stock market is clearly endogenous determined in the system and bear the burden of short-run adjustment towards the long-run equilibrium. Korea and the Philippines stock markets had mixture positive and negative significant ECTs while Indonesia, Malaysia and Singapore stock

markets had positive significant ECTs. The temporal Granger-causality channels are abstracted from Table 4 and summarized in Figure 2. Since there are three significant long run relationships between the variables, therefore we get three groups of short run relationships. For the first group, changes in Thailand stock market will affect Korea stock market and indirectly affected Malaysia stock market too via Korea. There is one bidirectional causal effect between Malaysia and China stock markets. In the second group, the Philippines spread out the risk to Indonesia and US stock markets. Meanwhile, the last group has a unidirectional causal effect running from Singapore to the US stock market.

The results of cointegration during post-crisis period in Table 2 (part C), for second model indicates that only one significant long run relationship exist among ASEAN-5, China, Japan, Korea and US stock markets. Table 5 provides result of Granger causality tests based on VECM. Statistically significant ECT only in the equations for Singapore, China and Indonesia. However, only the ECTs for Singapore and China carried the correct sign. The economic intuition arising from the findings imply that when there is a deviation from the equilibrium cointegrating relationships in this system, it is mainly the changes in Singapore and China stock markets that adjusts to clear the disequilibrium, i.e., bears the brunt of short-run adjustment to long-run equilibrium. The temporal Granger-causality channels are abstracted from Table 5 and summarized in Figure 3. It's clearly showed that US stock market is exogenous whereas Thailand stock market is endogenous in the short run. There is unidirectional causal effect running from US to Japan and US to Singapore. At the same time, Singapore stock market also affected by Japan stock market. Malaysia stock market is Granger-caused by Japan and Singapore stock markets. There also causal effect from Singapore to the Philippines. Lastly, changes in Thailand stock market caused by changes in Malaysia, Singapore and the Philippines stock markets.

6. Conclusions

This study attempts to examine the linkages between the ASEAN-5+3 and U.S. stock markets. The empirical analysis of this study begins with the Augmented Dickey-Fuller and Phillips-Perron stationarity tests in order to determine at which level do the data exhibit stationarity for the purpose of cointegration analysis application. Results show that the long-run relationships between ASEAN-5+3 stock markets occur only for during- and post-crisis period. For the pre-crisis period, there is no significant cointegrating vector among the ASEAN-5+3 stock markets. Before and during-crisis, the number of cointegrating vector increased after US stock market had been included in the model during the crisis. This implied that the system is more interdependence. Hence, by adding US stock market is not helping investors to reduce the portfolio risk. The results of short-run Granger-causality based on VECM showed that Thailand stock market is the most exogenous markets. Surprisingly, China and Korea stock markets are active in short-run only during-crisis but not before and after crises. These probably due to most of the markets are more sensitive to changes in other's market during the crisis period.

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Notes

Note 1. Choudhry *et al.* (2007) also divide their total sample into sub-samples of pre-crisis and post-crisis.

Note 2. Both test show different significant level. Therefore, we only consider when both statistics agreed upon at two significant cointegrating vectors.

Note 3. Except ASEAN-5 with Korea before crisis.

Table 1. DF/ADF and PP unit root tests

Countries	DF/ADF								PP							
	Level				1st Difference				Level				1st Difference			
	Constant	k	Trend	k	Constant	k	Trend	k	Constant	k	Trend	k	Constant	k	Trend	k
Pre-crisis period (I Jan, 1990 - 30 June, 1997)																
Malaysia	-0.89	0	-2.14	0	-18.38**	0	-18.35**	0	-0.94	2	-2.22	1	-18.36**	4	-18.33**	4
Singapore	-0.87	0	-2.23	0	-18.12**	0	-18.09**	0	-1.00	3	-2.49	4	-18.12**	0	-18.09**	0
Thailand	-1.23	0	-0.92	0	-18.74**	0	-18.76**	0	-1.42	7	-1.11	6	-18.80**	5	-18.80**	5
Indonesia	-0.74	2	-1.58	2	-10.34**	1	-10.43**	1	-1.01	11	-1.66	11	-18.46**	11	-18.39**	10
The Philippines	-2.22	0	-2.46	0	-12.51**	0	-12.48**	0	-2.34	1	-2.46	0	-12.51**	5	-12.48**	5
Japan	-3.31*	0	-2.88	0	-20.53**	0	-20.65**	0	-3.31*	4	-2.93	5	-20.53**	5	-20.63**	4
Korea	-1.84	0	-2.38	0	-19.96**	0	-19.95**	0	-1.83	1	-2.38	0	-19.96**	3	-19.95**	3
US	1.60	0	-1.36	0	-21.04**	0	-21.23**	0	1.97	13	-1.23	10	-21.04**	9	-21.32**	11
During-crisis period (7 July, 1997 - 29 June, 1998)																
Malaysia	-1.40	0	-1.95	0	-7.72**	0	-7.64**	0	-1.35	3	-1.94	3	-7.75**	2	-7.67**	2
Singapore	-0.68	0	-2.56	0	-8.17**	0	-8.11**	0	-0.57	3	-2.68	4	-8.20**	2	-8.14**	2
Thailand	-0.26	0	-1.14	0	-6.30**	1	-6.24**	0	-0.56	3	-1.59	4	-6.39**	3	-6.34**	3
Indonesia	-2.45	0	-2.15	0	-8.78**	0	-8.98**	0	-2.40	1	-2.00	1	-8.74**	2	-8.98**	2
The Philippines	-2.34	0	-2.20	0	-7.96**	0	-7.96**	0	-2.30	1	-2.14	1	-7.96**	0	-7.95**	1
Japan	-2.17	0	-2.04	0	-7.54**	0	-7.70**	0	-2.10	5	-1.94	3	-7.57**	4	-7.93**	6
Korea	-0.81	0	-1.75	0	-8.36**	0	-8.29**	0	-0.81	3	-1.93	4	-8.25**	4	-8.18**	4
China	-1.11	0	-2.84	1	-5.66**	0	-5.65**	0	-1.25	2	-2.23	2	-5.61**	7	-5.67**	8
US	-0.89	0	-2.63	2	-9.32**	0	-9.29**	0	-0.78	4	-2.20	3	-9.23**	1	-9.20**	1
Post-crisis period (6 July, 1998 - 28 May, 2007)																
Malaysia	-1.39	1	-2.07	1	-19.09**	0	-19.07**	0	-1.65	7	-2.35	7	-19.37**	6	-19.35**	6
Singapore	-1.11	0	-1.43	0	-20.16**	0	-20.14**	0	-1.27	7	-1.64	7	-20.24**	6	-20.22**	6
Thailand	-1.27	0	-1.94	0	-13.01**	1	-13.00**	1	-1.36	3	-2.13	4	-21.56**	3	-21.54**	3
Indonesia	0.66	0	-1.36	0	-20.04**	0	-20.14**	0	0.24	11	-1.69	11	-20.49**	11	-20.53**	11
The Philippines	0.04	0	-0.69	0	-19.09**	0	-19.21**	0	-0.49	7	-1.10	7	-19.46**	6	-19.52**	5
Japan	-1.04	0	-0.82	0	-21.92**	0	-22.03**	0	-1.06	6	-0.82	5	-21.92**	6	-22.02**	5
Korea	-1.88	0	-2.39	0	-23.22**	0	-23.20**	0	-1.90	9	-2.49	10	-23.15**	10	-23.13**	10
China	1.78	0	1.54	0	-19.80**	0	-19.98**	0	1.09	8	1.01	7	-20.23**	9	-20.26**	8
US	-1.67	0	-2.10	0	-23.20**	0	-23.20**	0	-1.44	8	-1.95	7	-23.38**	9	-23.39**	9

Notes: Asterisk (**) and (*) denotes 99% and 95% of significant level.

Table 2. Cointegration Tests Results

Vectors	r = 0	r ≤ 1	r ≤ 2	r ≤ 3	r ≤ 4	r ≤ 5	r ≤ 6	r ≤ 7
Part A : Pre-crisis results (Jan 1, 1990 - June 30, 1997), Lags = 5								
Model 1: ASEAN-5 with Korea in the VAR								
Trace	97.844	60.684	39.742	21.414	8.212	0.076	-	-
Critical Value (1%)	103.18	76.07	54.46	35.65	20.04	6.65	-	-
Max-Eeigen	37.16	20.942	18.328	13.202	8.136	0.076	-	-
Critical Value (1%)	45.1	38.77	32.24	25.52	18.63	6.65	-	-
Eigenvalues	0.202	0.119	0.105	0.077	0.048	0	-	-
Model 2: ASEAN-5 with Korea and U.S. in the VAR								
Trace	145.177[a]	92.771	60.592	38.334	17.079	5.399	0.7	-
Critical Value (1%)	133.57	103.18	76.07	54.46	35.65	20.04	6.65	-
Max-Eeigen	52.407[a]	32.179	22.258	21.255	11.679	4.7	0.7	-
Critical Value (1%)	51.57	45.1	38.77	32.24	25.52	18.63	6.65	-
Eigenvalues	0.272	0.177	0.126	0.121	0.068	0.028	0.004	-
Part B : Crisis results (July 1, 1997 - Jun 30, 1998), Lags = 3								
Model 1: ASEAN-5 with China, Korea, Japan in the VAR								
Trace	230.413[a]	169.929[a]	118.119[a]	73.133	42.051	20.883	6.738	0.005
Critical Value (1%)	168.36	133.57	103.18	76.07	54.46	35.65	20.04	6.65
Max-Eeigen	60.484[a]	51.810[a]	44.986	31.083	21.168	14.144	6.733	0.005
Critical Value (1%)	57.69	51.57	45.1	38.77	32.24	25.52	18.63	6.65
Eigenvalues	0.747	0.692	0.64	0.507	0.382	0.275	0.142	0.000
Model 2: ASEAN-5 with China, Korea, Japan and U.S. in the VAR								
Trace test	378.608[a]	272.429[a]	200.273[a]	137.640[a]	95.281[a]	58.550[a]	27.126	7.894
Critical Value (1%)	204.95	168.36	133.57	103.18	76.07	54.46	35.65	20.04
Max-Eeigen	106.179[a]	72.157[a]	62.633[a]	42.358	36.731	31.424	19.232	6.847
Critical Value (1%)	62.80	57.69	51.57	45.1	38.77	32.24	25.52	18.63
Eigenvalues	0.91	0.806	0.759	0.618	0.566	0.51	0.354	0.144
Part C : Post-crisis results (July 6, 1998 - May 28,2007), Lags = 6								
Model 1: ASEAN-5 with China, Korea, Japan in the VAR								
Trace test	192.575[a]	128.098	81.915	49.077	29.283	14.872	4.509	0.747
Critical Value (1%)	168.36	133.57	103.18	76.07	54.46	35.65	20.04	6.65
Max-Eeigen	64.477[a]	46.183	32.838	19.794	14.411	10.363	3.761	0.747
Critical Value (1%)	57.69	51.57	45.1	38.77	32.24	25.52	18.63	6.65
Eigenvalues	0.16	0.117	0.085	0.052	0.038	0.028	0.01	0.002
Model 2: ASEAN-5 with China, Korea, Japan and U.S. in the VAR								
Trace test	229.335[a]	161.961	116.318	79.069	45.881	24.531	10.796	2.169
Critical Value (1%)	204.95	168.36	133.57	103.18	76.07	54.46	35.65	20.04
Max-Eeigen	67.374[a]	45.643	37.249	33.188	21.35	13.735	8.627	1.303
Critical Value (1%)	62.80	57.69	51.57	45.1	38.77	32.24	25.52	18.63
Eigenvalues	0.166	0.116	0.096	0.086	0.056	0.036	0.023	0.004

Note: [a] denotes respectively, the significance at 99% confidence interval.

Table 3. Granger-causality based on VECM [pre-crisis (with US)]

k=5, r=1	Independent variables							
Dependent Variables	Δ *US*	Δ *MAS*	Δ *SIN*	Δ *PHI*	Δ *IND*	Δ *THAI*	Δ *KOR*	*ECT*
				F-statistics				
Δ *US*		2.142	2.239	0.752	2.900[b]	1.217	0.949	-0.001
		[0.079]	[0.068]	[0.558]	[0.024]	[0.307]	[0.438]	
Δ *MAS*	2.564[b]		1.367	2.629[b]	1.541	1.419	1.375	-0.010
	[0.041]		[0.249]	[0.037]	[0.194]	[0.231]	[0.246]	
Δ *SIN*	2.177	0.479		1.207	1.175	0.441	0.742	-0.059[a]
	[0.075]	[0.751]		[0.311]	[0.325]	[0.779]	[0.565]	
Δ *PHI*	2.594[b]	0.183	1.510		2.310	1.836	0.523	-0.055[b]
	[0.039]	[0.947]	[0.203]		[0.061]	[0.126]	[0.719]	
Δ *IND*	1.638	0.425	0.893	0.199		2.943[b]	0.860	0.010
	[0.168]	[0.791]	[0.470]	[0.938]		[0.023]	[0.490]	
Δ *THAI*	0.797	0.528	0.337	0.652	0.253		0.480	0.050
	[0.529]	[0.715]	[0.853]	[0.627]	[0.907]		[0.751]	
Δ *KOR*	1.377	0.875	0.713	1.833	1.594	0.081		-0.084[a]
	[0.245]	[0.481]	[0.584]	[0.126]	[0.179]	[0.988]		

Notes: The ECT was derived by normalizing the cointegration vector on *US*, with the residual checked for stationarity by way of unit root tests and inspection of its ACF. Figures presented in the final column are coefficient values associated with estimated *t*-statistics testing the null that the ECT is statistically insignificant for each equation. All other estimates are asymptotic Granger *F*-statistics. [a] and [b] indicate significance at the 1% and 5% levels. P-values are presented in the parenthesis [ ]. The following notations apply in the table: US=United States, MAS=Malaysia, SIN=Singapore, PHI=Philippines, IND=Indonesia, THAI=Thailand and KOR=Korea.

Table 4. Granger-causality based on VECM [during-crisis (with US)]

k=3, r=3	Independent variables											
Dependent variables	Δ *CHI*	Δ *JAP*	Δ *KOR*	Δ *IND*	Δ *MAS*	Δ *PHI*	Δ *SIN*	Δ *THAI*	Δ *US*	ECT_1	ECT_2	ECT_3
					F-statistics							
Δ *CHI*		2.755	1.110	0.905	4.113[b]	0.090	0.938	0.342	0.067	-0.219	-0.625[a]	0.131
		[0.086]	[0.347]	[0.419]	[0.030]	[0.914]	[0.406]	[0.714]	[0.936]			
Δ *JAP*	0.693		1.104	0.155	0.776	1.182	0.565	1.323	2.891	-0.218	0.053	0.105
	[0.510]		[0.348]	[0.858]	[0.472]	[0.325]	[0.576]	[0.286]	[0.076]			
Δ *KOR*	3.161	0.552		1.198	0.876	2.664	0.411	7.837[a]	1.832	-1.902[a]	-1.252[b]	0.694[a]
	[0.061]	[0.583]		[0.320]	[0.430]	[0.091]	[0.668]	[0.003]	[0.183]			
Δ *IND*	1.179	2.679	2.702		1.159	4.313[b]	2.539	0.877	1.518	0.090	1.792[a]	-0.095
	[0.326]	[0.090]	[0.089]		[0.331]	[0.026]	[0.100]	[0.430]	[0.240]			
Δ *MAS*	3.418[b]	2.156	5.332[b]	0.470		0.935	0.032	0.632	0.222	0.534	1.232[b]	-0.374
	[0.050]	[0.139]	[0.013]	[0.631]		[0.407]	[0.969]	[0.541]	[0.803]			
Δ *PHI*	0.996	2.206	1.638	0.381	0.570		1.033	2.001	0.256	0.897[b]	1.595[a]	-0.658[a]
	[0.385]	[0.133]	[0.216]	[0.687]	[0.573]		[0.372]	[0.158]	[0.777]			
Δ *SIN*	1.082	2.531	1.671	0.265	0.952	0.624		1.022	0.214	0.566	1.066[b]	-0.396
	[0.355]	[0.102]	[0.210]	[0.769]	[0.401]	[0.545]		[0.376]	[0.809]			
Δ *THAI*	1.599	0.421	3.019	1.226	0.076	1.531	3.178		2.037	0.434	0.660	-0.216
	[0.224]	[0.661]	[0.069]	[0.312]	[0.927]	[0.238]	[0.060]		[0.153]			
Δ *US*	0.169	0.216	0.668	0.538	0.265	7.553[a]	7.016[a]	1.504		-0.102	-0.138	0.012
	[0.846]	[0.808]	[0.522]	[0.591]	[0.770]	[0.003]	[0.004]	[0.243]				

Notes: The ECT_1 was derived by normalizing the cointegration vector on *CHI*, The ECT_2 was derived by normalizing the cointegrating vector on *JAP* whereas The ECT_3 was derived by normalizing the cointegrating vector on *KOR,* with the residual checked for stationarity by way of unit root tests and inspection of its ACF. Figures presented in the final column are coefficient values associated with estimated t-statistics testing the null that the lagged ECT is statistically insignificant for each equation. All other estimates are asymptotic Granger *F*-statistics. [a] and [b] indicate significance at the 1% and 5% levels. P-values are presented in the parenthesis [ ]. The following notations apply in the table: CHI=China and JAP=Japan.

Table 5. Granger-causality based on VECM [post-crisis (with US)]

k=6, r=1	Independent variables									
Dependent variables	Δ *THAI*	Δ *MAS*	Δ *PHI*	Δ *SIN*	Δ *JAP*	Δ *US*	Δ *CHI*	Δ *IND*	Δ *KOR*	*ECT*
	F -statistics									
Δ *THAI*		3.864[a]	2.825[b]	3.734[a]	2.152	2.188	2.237	0.966	0.999	-0.007
		[0.002]	[0.016]	[0.003]	[0.059]	[0.055]	[0.051]	[0.439]	[0.418]	
Δ *MAS*	0.675		1.485	4.727[a]	2.773[b]	2.135	0.265	1.638	1.509	-0.009
	[0.642]		[0.194]	[0.000]	[0.018]	[0.061]	[0.932]	[0.149]	[0.186]	
Δ *PHI*	1.239	2.161		3.522[a]	1.910	1.111	0.447	0.569	0.373	-0.005
	[0.290]	[0.058]		[0.004]	[0.092]	[0.354]	[0.815]	[0.724]	[0.867]	
Δ *SIN*	0.654	0.709	1.922		2.667[b]	3.603[a]	0.341	0.929	0.915	-0.019[a]
	[0.659]	[0.617]	[0.090]		[0.022]	[0.004]	[0.888]	[0.462]	[0.472]	
Δ *JAP*	0.863	0.114	0.955	1.275		3.631[a]	0.521	0.077	1.087	0.010
	[0.506]	[0.989]	[0.445]	[0.274]		[0.003]	[0.760]	[0.996]	[0.367]	
Δ *US*	0.948	0.616	0.574	0.643	1.334		0.446	0.726	0.991	0.003
	[0.450]	[0.688]	[0.720]	[0.667]	[0.249]		[0.816]	[0.604]	[0.423]	
Δ *CHI*	0.491	0.475	0.477	1.287	1.361	0.570		2.238	0.666	-0.017[b]
	[0.783]	[0.795]	[0.793]	[0.269]	[0.239]	[0.723]		[0.051]	[0.650]	
Δ *IND*	0.538	1.312	1.206	1.280	0.391	0.949	0.968		0.966	0.026[a]
	[0.747]	[0.259]	[0.306]	[0.272]	[0.855]	[0.449]	[0.437]		[0.439]	
Δ *KOR*	1.228	0.741	0.468	0.848	0.718	2.024	1.208	1.024		-0.011
	[0.295]	[0.593]	[0.800]	[0.517]	[0.610]	[0.075]	[0.305]	[0.403]		

Notes: The ECT was derived by normalizing the cointegration vector on *THAI*, with the residual checked for stationarity by way of unit root tests and inspection of its ACF. Figures presented in the final column are coefficient values associated with estimated t-statistics testing the null that the lagged ECT is statistically insignificant for each equation. All other estimates are asymptotic Granger *F*-statistics. [a] and [b] indicate significance at the 1% and 5% levels. P-values are presented in the parenthesis [ ].

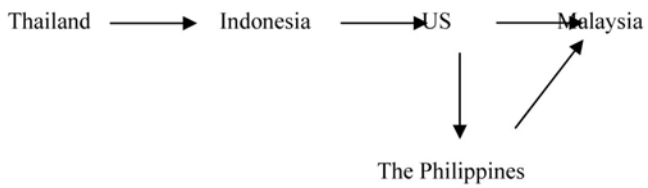

Figure 1. Short-run causality effect [pre-crisis (with U.S.)]

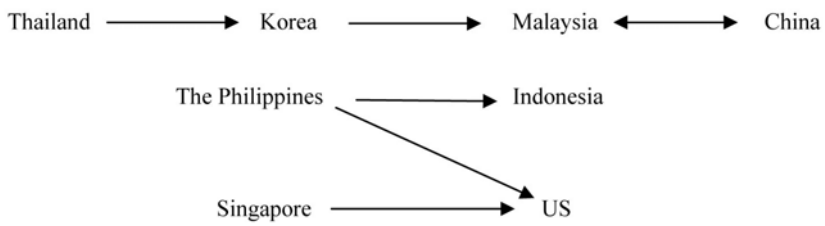

Figure 2. Short-run causality effect [during-crisis (with U.S.)]

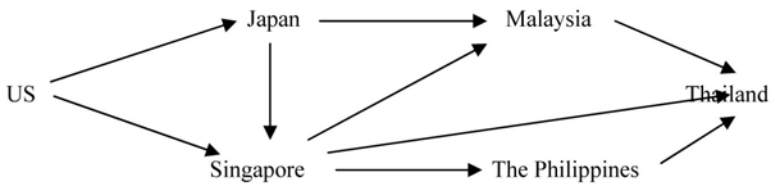

Figure 3. Short-run causality effect [post-crisis (with US)]

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Concept of Voluntary Information Disclosure and A Review of Relevant Studies

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Abstract

Along with the economic development, the compulsory information disclosure of listed companies can not satisfy investors' diversified information needs. The society advances higher requirements for listed companies' information disclosure, which drives listed companies to disclose more information voluntarily. Recently, voluntary disclosure has gradually become a focus domestic and abroad because voluntary disclosure has positive impacts on the communication of corporate management agency and interests-related parties, the decrease of information asymmetry of investors, and the improvement of quality of disclosed information. On one hand, voluntary disclosure can detail and deepen compulsory disclosure, improving the credibility and completeness of compulsory disclosure. On the other hand, it can complement and expand the compulsory disclosure, for the sake of realizing the more complete, diversified, and systematic information disclosure. Therefore, the voluntary disclosure serves as an effective way for communicating interest-related parties and describing the corporate prospect. It is meaningful for perfecting listed companies' governance structure and enhancing the protection for investors' interests.

Keywords: Information disclosure, Voluntary, Compulsory, Literature review

1. The concept of information disclosure system and the evolvement of disclosure way

Information disclosure is also named as information publicity. Information disclosure system means a series of behavioral regulations and activity standards for relevant parties in the securities market who publicize the information related with securities by certain way in the process of issuing stocks, listing on the market, and trading, according to laws, and rules of securities administrative agencies and stock exchanges. To ask companies that issue securities openly to execute the information disclosure system is the core content of modern securities market. It covers the whole process of securities' issue and circulation. Usually, before the issue of stocks, companies publicize stock-issuing introductions, listing announcements, interim reports, annual reports, and grave affair reports, mainly including companies' operations and financial statements.

At the initial stage of securities market, voluntary disclosure is dominating. What securities regulatory agencies believe is the "invisible hand". Driven by interests, participators' rational trading activities can make securities market realize a balance in which "information is disclosed completely and resources are allocated effectively". However, the New York Stock Exchange Panic in 1929 has stricken seriously the regulatory idea of "invisible hand". The U.S. Congress issued the Securities Act of 1933 and the Securities Exchange Act of 1934, and formed the Securities and Exchange Commission (SEC), which signalized a transformation from voluntary disclosure to compulsory disclosure.

Compulsory information disclosure means relevant laws and rules, such as Company Law, Securities Law, Accounting Rules, and regulatory agencies' regulations, clearly regulate that listed companies must actualize information disclosure. Voluntary disclosure means, except for compulsory disclosure, listed companies disclose information voluntarily for the sake of companies' images, investors, and accusation risks avoidance. On Jan. 29, 2001, the Business Reporting Research Project (BRRP) under the Financial Accounting Standards Board (FASB) (FASB, 2001) issues the Improving Business Reporting: Insights into Enhancing Voluntary Disclosure Steering Committee Report. This report chooses many listed companies in 8 industries as samples, summarizes voluntary disclosure's types, frame, costs, and effects, and makes prospect for the future business reports. It defines voluntary disclosure as: the information disclosed voluntarily by listed companies, but not the basic financial information that is required to be publicized by the widely acceptable accounting principles and the requirements of securities regulatory agencies. Voluntary disclosure aims at introducing and explaining companies' potentials to investors, driving the fluidity of capital market, guaranteeing more effective allocation of capitals, and decreasing capital costs. Achieve a more positive communication with investors as perfecting the information disclosure market regulatory rules.

Viewing from the development of information disclosure system, voluntary disclosure appears after compulsory information disclosure. In a sense, voluntary disclosure is the extension and complement of compulsory information disclosure system. Different history periods, the two may have different concepts. According to relevant laws and regulations, compulsory disclosure and voluntary disclosure can be transformed mutually. In different economic, political, legal, and social environments, countries face different conditions concerning voluntary disclosure due to the differences in relevant laws.

On the other hand, compulsory disclosure can depress or affect voluntary disclosure. Ronen and Raari (Ronen & Yaari, 2002, p21-23) point out that compulsory disclosure can not stop the disclosure of false information but restrain voluntary disclosure. Therefore, some companies may choose to adopt a partial disclosure strategy by which they merely disclose positive news or negative news. A research completed by Gigler F. and T.Hemmer (Gigler F. & T.Hemmer, 1998, p117-147) shows that the perfect of compulsory disclosure and relevant market regulatory have two impacts on voluntary disclosure.

(1) Reduce listed companies' voluntary disclosure. If listed companies have been asked to disclose more information, voluntary disclosure will increase companies' costs, including information process and issue costs, accusation risks, and losing competitive advantages. Meanwhile, compulsory disclosure is replaceable, which makes managers short of motives for voluntary disclosure.

(2) Under the circumstance of poor quality of compulsory disclosure and powerless market regulatory, managers adopt voluntary disclosure to send signals to the capital market, with the hope of obtaining a positive feedback. At this moment, more information will be disclosed voluntarily.

Stocken (Stocken, P.C., 2000, p359-374) studies the credibility of voluntary disclosure. Conclusions show that along with the improvement of information quality in compulsory disclosure, the information quality of voluntary disclosure will be improved either. If time period is long, punishment is effective, and the information quality in compulsory disclosure is so good that it can be used as evaluation standards for voluntary disclosure, corporate managers will disclose true information voluntarily.

2. Differences between voluntary disclosure and compulsory disclosure

According to the contents of information disclosure, it can be sorted into voluntary disclosure and compulsory disclosure. In order to define the concept of voluntary disclosure clearly, we list differences between the two in Table 1 as follow.

Besides, foreign scholars hold different opinions toward voluntary disclosure.

Haskins, Ferris, and Selling (Haskins M.E, K.R..Ferris & T.L. Selling, 2000) agree that in 90s in 20th century the information asymmetry risk is rising in securities market. It is more possible for Asia new immature market hiding bad news than Europe and America mature markets. In other words, the opportunism behaviors are more popular than ever. Because more and more Asian companies focus on foreign capitals in financing, they must realize a more transparent disclosure. For the sake of self pursuit, companies prefer to disclose more information voluntarily. Furthermore, companies should understand the potential pressure that securities analyzers and other information channels can provide sufficient and rich information. If information is from intermediary agencies but not be disclosed by companies, it is hard to decrease the capital casts. Besides, voluntary disclosure is under the influences of ownership distribution. Most Europe and America companies are separate ownership. Lost of shareholders ask higher requirements for information disclosure. So, the degree of voluntary disclosure in these companies is high. In contrast, Asian companies have concentrated ownership. Shareholders, differing from western shareholders, require less for financial reports. So, the degree of voluntary disclosure in these companies is low.

Cooke, T.E (Cooke, T. E., 1999, p174-89) assesses the voluntary disclosure of Japanese corporations. He points that corporations hold a conservative and resist attitude toward increasing information disclosure. An important decisive factor for the degree of information disclosure is the size of corporation. Another factor is the types of listed companies. Studies prove that listed companies with many kinds of stocks disclose more information than that with one kind of stock.

Choi, Frost, and Meek (Choi, F.D.S., Frost C. & Meek, 1999) recognize that why voluntary disclosure is at a lower degree in tradition is because the administrative authorities think that the cost of voluntary disclosure is higher than the return. But strong economic motive may change the traditional attitude. For example, when there is a strong demand for international capitals, conservative companies will change their information disclosure attitude and behaviors sharply.

Healy P M, Palepu KG (Healy, P. & Palepu, K., 1993, p1-11) think that the credibility of voluntary disclosure associates closely with the professional level of intermediary agencies. Intermediary agencies offer guaranties for voluntary disclosure to certain degree. Meanwhile, investors' acceptance to the credibility of voluntary disclosure also affects listed companies' strategy of information disclosure.

Botosan (Botosan, C.A., 1997, p323-350), from Utah State University, scores the disclosure of 122 manufacturing companies by an average voluntary disclosure index, and calculates the costs of equity capital by a pricing model created by Ohlson, then finds the relationship between the two. Finally, he finds that there is a positive correlation between costs of equity capital and corporate risks. Studies show that voluntary disclosure can decrease costs of equity capital.

Healy (Healy P, Hutton A. & Palepu k., 1999, p485-520), from Harvard Business School, selects 97 companies to study whether the rise of voluntary disclosure is accompanied with improvement of market. Studies show that: as disclosure is improved, sample companies' stock prices rise by 7% in average at the current year; at the second year, stock price rises by 8%; during the current year and the following three years, the number of institutions holding sample companies' stocks rise by 12% - 24% in average. Besides, the sample companies are highly praised by more financial analyzers. The fluidity of stocks is stronger and the uncertainty of investors is lower.

3. Studies on influencing factors of voluntary disclosure domestic and abroad

Many empirical studies concern the influencing factors of voluntary disclosure in foreign countries. As a matter of fact, empirical studies mostly concentrate on listed companies in certain country.

Chow (Chow C.W. & Wong-Boren. A., 1987, p533-541) make an empirical research on 52 Mexican manufacturing corporations' voluntary disclosure. They select three independent variables, namely corporate size, financial leverage, and assets, to make a regression analysis. Results show that voluntary disclosure is far different among these corporations, which only associates with corporate size, and has nothing to do with the other two factors. Hossain and his partners (Hossain, M., Perera, M.M.B, & Rahman, A.R., 1995, p69-87) make an empirical study on New Zealand companies' voluntary disclosure. At that time, the economy in New Zealand is developing toward more opening and competitive. Many companies try every means to attract investors. Empirical studies show that corporate size, financial leverage, assets proportion, authority of audit institution, and listing in other area exert significant impacts on voluntary disclosure. Mitchell (Mitchell, Jason. D, Chia, Chris. W. L. & Loh, Andrew. S., 1995, p1-16) and his partners make an empirical research on the influencing factors of listed companies performing voluntary disclosure of segment information in Australian exploration and oil industry. Results show that corporate size and financial leverage have significant impacts on the level of disclosure. Cooke (Cooke, T.E., 1992, p229-237) completes an empirical study on Japanese listed companies' voluntary disclosure and compulsory disclosure by annual reports. Results show that the size, stock market listing and industry type have significant impacts on the level of disclosure, and listed manufacturing companies disclose more information than companies in other industries. Antti and Hannu (Antti, J. Kanto & Hannu, J. Schadewitz, 1997, p229-249) test the influencing factors of voluntary disclosure policy and compulsory disclosure policy adopted by non-financial companies listing in Helsinki Stock Exchange (Finland) from 1985 to 1993. They draw a conclusion that the type of company can determine the compulsory disclosure policy, but the voluntary disclosure is determined by not only the type of company, but also the size, capital structure, and the growth of company.

Later, in the tide of economic expansion and globalization, corporations grow fast. Gray, Meek and other scholars begin to notice multi-national companies' voluntary disclosure. Meek (Meek, G. K, Roberts, C. B., & Gray, S. J., 1995, p555-572) and his partners select 116 US, 64 UK, and 46 continental European multinational corporations as samples to make an empirical study on the factors influencing voluntary annual report disclosures. They find that the corporate size, the country or area where the corporation lives, the listing condition, and the industry turn into the most important influencing factors. Meek and his partners separate voluntary information into strategic information, non-financial information, and financial information. They find that the influence changes because of different information type. In specific, continental European multinational corporations disclose more strategic information than US and UK multinational corporations. UK and continental European multinational corporations disclose more non-financial information than US multinational corporations. Meanwhile, the larger the corporation is, the more it discloses information. The multinational corporations in oil, chemistry, and exploration industries need to disclose more non-financial information. For financial information, there is an effect of corporate size. And the regional differences are prominent. UK multinational corporations disclose less financial information than US and continental European multinational corporations. Meanwhile, multinational corporations listing in foreign areas disclose more financial information, what are under the influences of industrial factors either.

Studies completed by Gray, Meck, and Roberts (Gray, Sidney J. Gary K. Meek & Clare B. Roberts, 1993) show that companies that participate in international capital market prefer to perform more voluntary disclosures comparing with companies that operate only in domestic country. Gray and his partners study not only the impacts of listing in foreign areas on voluntary disclosure, but also many other variables, including the corporate size, location, industry, financial leverage, profitability, etc.

Choi and Levich (Choi, Frederick D.S. & Richard M. Levich, 1990) think that multinational corporations' voluntary disclosure aims at dealing with changes of international accounting principles. Many European and American documents concerning voluntary disclosure are mostly focusing on local areas, and seldom mention Asian countries.

Gerald and Sidney (Gerald K. Chau & Sidney J. Gray, 2002, p247-265) use the information disclosure table built by Meek and his partners to make an empirical study on the voluntary disclosure of 62 industrial listed companies in Hong Kong and Singapore. Studies show that the external shareholders' shareholding proportion is proportional to the level of corporate voluntary disclosure. Besides, because many listed companies in Hong Kong and Singapore are family companies, the empirical study shows that family companies' voluntary disclosure is less than that of non-family companies.

At present in China, studies on voluntary disclosure mainly focus on theories. Weidong He (Weidong He, 2002) analyzes listed companies' voluntary disclosure in perspective of corporate strategic management, considering the difficulties and chances in front of China's listed companies. Based on summarizing foreign experiences in securities regulatory agencies' measures and listed companies' voluntary disclosure, he discuses the internal motives and external phenomenon of China's listed companies' voluntary disclosure, and advances policy suggestions "encouraging voluntary disclosure, enhancing market regulatory". Derong Zhang (Derong Zhang, 2002, p22-23) suggests to enhance the voluntary disclosure in China and advances a selection method for information disclosure, considering the fact that Chinese companies seldom perform voluntary disclosure. Minghui Li (Minghui Li, 2001, p70-75) firstly makes an economic analysis of voluntary disclosure, and then analyzes reasons for why Chinese companies seldom implement voluntary disclosure. Minghui Li and Hai He (Minghui Li, Hai He & Xikui Ma, 2003, p38-43) analyze the disclosure of internally controlled information in Chiense listed companies in 2001 and conclude that the internally controlled information in Chinese listed companies are mostly useless, without any essential content at present. Listed companies have no strong motives for voluntary disclosure. It reflects a fact in a sense that there is certain correlation between the disclosure of internally controlled information and financial report quality, and corporate quality. It is necessary to update relevant rules, making specific and feasible regulations on the disclosure of internally controlled information, enhancing audit to disclosure by registered accountants, and promoting the disclosure of internally controlled information. Yunfang Zhao and Yunfeng Li (Yunfang Zhao & Yunfeng Li, 2003, p284-285) suggest to strengthen the supervision and management of voluntary disclosure. As improving the voluntary disclosure quality, evaluate accounting information reasonably. By this way, it benefits investors on one hand. On the other hand, it drives companies to actualize timely and reasonable voluntary disclosure.

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Table 1. A comparison of voluntary disclosure and compulsory disclosure.

Item \ Way of disclosure	Voluntary disclosure	Compulsory disclosure
Definition	Except compulsory disclosure, the information disclosed by listed companies for the sake of corporate images, relationship with investors, and avoidance of accusation risks	The information that is required to be disclosed according to the securities law, accounting principles, and regulatory agencies' regulations
Motive	Self-interested information communication between listed companies and other interest-related parties	Use laws and regulations to adjust the information communication between listed companies and other interest-related parties
Content	Companies' future strategies, R&D plans, prediction information, purchase and merger information, investment project analysis, and financial information analysis, etc.	Companies introduction, basic financial information, information about the board and top managers, vital related transactions, explains for important items
Carrier	Annual reports, public announcement, booklets, website, road show, etc.	Annual report, interim report, and season report
Time	At the right time	Fixed time in a year and a season
Balance mechanism	Corporate governance mechanism's design and effectiveness	Laws' regulations and execution
Root of disclosure	Economic globalization and globalization of capital market	Monopoly of companies on self information

Table 2. A review of some literatures on voluntary disclosure.

Chief author	Time	Sample country or area	Industry	Significant influencing factor
Chow	1987	Mexico	Manufacture	Corporate size, financial leverage, asset proportion
Hossain	1995	New Zealand	No limits	Corporate size, financial leverage, asset proportion, authority of audit institutions, listing in foreign areas
Mitchell	1995	Australia	Exploration and oil	Corporate size, financial leverage
Cooke	1992	Japan	No limits	Corporate size, stock in market, type of industry
Antti	1997	Finland	Non-financial and non-insurance	Corporate size, capital structure, corporate growth, corporate type
Meek	1995	US, UK, continental European	Multinational corporation, no limits for industry	Corporate size, conditions of country or area where corporations operate, industry
Gerald	2002	Hong Kong, Singapore	Industry	External shareholders' shareholding proportion

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Role of Parent Control of International Joint Venture in Gaining Competitive Advantage

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Abstract

This article aims to investigate role of foreign parent control of international joint ventures (IJVs) in gaining sustainable competitive advantages from partnership with local firm through achieving 1) accesses to local firm's proprietary resources, 2) promoting knowledge and skills acquisition, 3) economies of scale and scope, 4) market position. Foreign parent firm control is conceptualized across three dimensions including the control mechanism, the control focus, and the extent of control. As foundation theories, resource dependent theory and organizational learning theory are employed. Our empirical evidence is based on the survey data collected from Finnish firms that established IJVs with local firms in the 1990s. The empirical evidence shows that in order to achieve successfully competitive advantages when entering IJVs, foreign parent firms need to have comparable IJV control structures which fit with their intended specific competitive advantages.

Keywords: Parent control, International joint ventures, Competitive advantage, Resource dependent theory, Organizational learning theory

1. Introduction

In the last decades, establishment of IJVs has become a major strategy for firms entering international markets (Ding, 1997; Duan, 2007; Dunning, 1995; Li, 2003; Meschi & Riccio, 2008). The rationale behind the formation IJVs is often related to the increasing speed of technological change and the rapidly growing competitiveness in global markets (Huaning, Colin & Barry, 2008), and to maximize profits through growth or improvement of competitive positions. Partners establish IJVs in order to diversify risks inherent in developing new technologies or to take advantage of the complementary of each partner's developmental skills (Hergert & Morris, 1988). The new partnerships can also provide essential economies of scale and market power to withstand a dominant competitor whom neither partner can challenge individually (Huaning, Colin & Barry, 2008). Such a functional classification of IJVs, however, does not say much about their competitive context. Porter and Fuller (1986) point out that coalitions represent an important strategic option in international competition. Firms in a weak position may defend themselves against dominant players through coalition (Child & Faulkner, 1998). A challenger may form an alliance to obtain necessary resources, technology, market access, or other strengths to fight again an industry leader (Porter, 1985, 1998). Despite the fact that there are many studies focus on IJV, most studies have focused on partner selection, ownership, cross cultural management, technology transfer, motives, and performance. Previous researchers suggested that the strategic motives of parent firms determine their control in IJVs (e.g. Calantone & Zhao, 2001; Chalos & O'Connor, 1998). The issue of the relationship between parent firm's motive of achieving competitive advantage through IJVs and parent control has been ignored. This study is to fill this gap. Using resources dependent theory and organizational learning as foundations theories, this study aims to discuss *how parent firms can achieve their competitive advantage through proper control of their IJVs*.

In this study, an IJV is regarded as a separate entity formed by a multinational company (MNC) or multinational companies and a local firm or local firms either through greenfield investment or partial acquisitions. According to Harrigan (1985), foreign parent firms form IJVs to generate internal benefits, competitive benefits, and strategic benefits.

The resources contributed to a partnership usually are land, equipment, labor, money, or patents. Both the contribution and withdrawal of resources are explicit and thus relatively simple to control. In contrast, competencies are fundamentally information based invisible assets (Itami, 1987) that cannot be readily purchased and their market value

is difficult to ascertain such as management and organizational skills, knowledge of the market, or technological capability. Invisible assets are embodied in people within the organization. These assets represent a tacit knowledge that is difficult to understand and that can only be appropriated over time, if at all (Teece, 1986).

This study focuses on how parent firms can achieve competitive advantages such as gaining *skills*, *assesses* from local firms, achieve *economies of scale and scope*, and *market position* when entering into IJVs because these gains are seen as the foundation for a sustainable competitive advantage (Aaker, 1988; Day, 1990; Dunning, 1995; Porter, 1985). In the following sections, we conceptualize the IJV control. Then, we elaborate foundation theories for our analysis. After that we analyze how parent firms can achieve competitive advantages through exercising proper control over their IJVs. We conclude the study by pointing out the implications for researchers and managers, and indicate some opportunities for future research.

2. Conceptualization of IJV control

In the organizational literature, management control means the process by which an organization influences its members and units to work in ways that meet the organizational objectives (Glaister & Buckley, 1998). According to Child et al. (2005: 15), control is a central aspect of management, and essential in any system that holds managers accountable for their actions and decisions. The main purpose of control is to attain predictability and critical information on IJV operation through some regulatory means (Makhija & Ganesh, 1997), and thus to safeguard the parent firm's interests. In the present study, the control of IJVs is defined as the influence of the foreign parent firms on the operations of the IJVs (Ding, 1997). Furthermore, researchers have acknowledged that control systems are complex and multidimension (see e.g Das & Teng, 1998; Geringer & Hebert, 1989; Lu & Hebert, 2005). Unfortunately, existing research tends to focus on only one dimension. To be able to capture the dynamic nature of IJV and conduct IJV control research thoroughly, this study adopts the multidimensional approach of control (mechanism, focus, and extent) advocated by Geringer and Hebert's (1989). In this section, these control dimensions are elaborated upon.

2.1 Control mechanisms

Control mechanisms are structural arrangements deployed to determine and influence what an organization's members do (Geringer & Hebert, 1989). Control mechanisms consist of a variety of mechanisms including formal and social controls that are available for firms exercising effective control to protect their interests in IJVs (Geringer &Hebert, 1989; Groot & Merchant, 2000). *Formal control* depends on hierarchies, standards, codified rules, procedures, goals, and regulations that specify desirable *patterns of behavior* (Das & Teng, 1998) aimed directly at protecting the assets of parent firms (Fryxell et al., 2002). Formal control mechanisms help to decrease the potential for opportunisms by controlling the assets through hierarchical means (Mjoen & Tallman, 1997). *Social control* is designed to promote expectations and mutual commitments through which the IJV managers learn to share the common attitudes and knowledge of the parent organization. Social control refers to mechanisms such as personal relations, informal communication, information exchange and training, mentoring, and development of a common organizational culture that foster shared values and norms without explicitly restricting the behavior of the targeted people by those social controls (Schaan, 1983; Das & Teng, 1998; Fryxell et al., 2002).

2.2 Control focus

Regarding the control focus, partners can choose to have a *broad control* focus and attempt to exercise control over the entire range of the IJV's activity, or they can have a *narrow control* that focuses on only one or two areas in IJV activities which they consider the most critical (Geringer & Hebert, 1989; Groot & Merchant, 2000). The most critical areas in IJVs are often: 1) Marketing, sales, and distribution; 2) Procurement; 3) General management and operation; 4) Finance and accounting; 5) R & D; 6) Production and quality; and 7) Human resources (Glaister et al., 2005). Depending on factors such as the parent firm's competencies and the goals of IJV activities, parent firms may focus their control on technology-related or market related activities (Child et al., 2005).

2.3 Control extent

Control extent refers to the tightness of control which is exercised (Geringer & Hebert, 1989). Tightly controlled organizations tend to be strict with respect to their employee's punctuality, and detail oriented, and precise in operation. Tight control can be effected through any mechanism that provides a partner with a high degree of certainty that personnel in the IJV will act as the given partner wishes. According to Child et al. (2005), the tightness of control is reflected in frequent and precise reporting. Controls can be tightened by more intensive training of IJV employees in production and management techniques. These dimensions of IJV control will be used as the IJV control structure when we discuss how foreign parent firms strategies determine the IJV control structure in the following section.

3. Foundation theories

3.1 Resource dependence theory (RDT)

RDT was developed by Emerson (1963) and further progressed by Pfeffer and Salancik (1978), who proposed that control over critical resources by one organization can make other firm dependence on it. Critical resources often are

technology, management know how, global service support, local knowledge, product distribution, material procurement, and equity share (Yan & Gray, 2001). Resource dependence theory assumes that even operating in the same industry, firms are heterogeneous in terms of their resources and capabilities. In addition, in competitive environments, to survive, organizations are dependence on each other for critical resources. By controlling resources, a firm can minimize the dependence on other firms and maximize the dependence of other firms on it. (Pfeffer & Salancik, 1978)

The resource dependence theory has viewed an IJV as a combination of parent firm resources, tangible and intangible, which create competitive advantages. Resource dependence theory is appropriate for examining IJVs because parent firms use IJVs to access valuable resources that they do not own (Chen & Chen, 2003). The power that from the resources the dependent parties needed can help the other parties to negotiate for higher level of control over IJV activities (Mjoen & Tallman, 1997). In addition, Emerson (1962) argued that power is a property of social relationships. The power among partners could be balanced if each depends on other in similar manner but not necessarily in the same things. In IJVs, power is needed to reduce uncertainty in partner's behavior and expected resource contributions. Besides, if resources are not exchanged as stated in IJV contracts, then IJV performance may not be as expected. Besides, withholding information is likely to result in inappropriate resource allocations, thus threatening and futile the relationship. As a result, where there is a great the dependence between partners, there is the need for information to be freely exchange parties (Guidice, 2001). Partners in IJVs want to control and maintain uninterrupted supply of the resources and information that they can not afford or are unable to procure on their own (Pfeffer & Salancik, 1978).

Resource dependence theory has emerged as an important explanation for the persistent firm level performance by emphasizing firm's ability to create and sustain competitive advantage by acquiring defending advantageous resources positions (Leiblein, 2003). In an IJV, the existing of resources of the firm is expanded by the resources of the other parent. Resource dependence theory assumes that firms within the same industry are heterogeneous in terms of their resources and capabilities; all assets can not be bought or sold in markets; decision makers are subject to bounded rationality; and strategy is used to achieve a competitive advantage (Peteraf, 1993). The competitive advantage of a firm is the result of a strategy that utilizes its unique resources and skills. The application of resource dependence theory will, therefore, deepen our understanding of what resources parent firms prefer to control and how they control them.

3.2 Organizational learning perspective

Organizational learning perspective is important in IJV literature (Guidice, 2001). Learning or knowledge acquisition is a way to achieve competitive advantage and enhance organizational performance (Leventhal & March, 1993). Fiol and Lyles (1985: 811) defined organization learning as the development of insights, knowledge between past actions, the effectiveness of those actions and the future actions. Regarding to learning in IJVs, Child & Yan (2003) pointed out three aspects of learning including learning from experience, formation learning, and operational learning. Learning from experience is a transfer relevant knowledge from previous experience of IJVs by parent firms. Formation learning take places when parent firms seeking and negotiating terms with new partners. Operational learning is learning how to work effectively with local parent firms in subsequent operation of an IJV. (Child & Yan, 2003: 287-288). Entering to new market through IJVs, the foreign parent firms certainly spend great amount of time to learn about their local partners. In their learning process from identifying suitable partners to forming process of IJVs, the foreign parent firms face with certain international barriers to work and make IJVs success with the local parents. In sum, each theory has it own limitations and the use of one single theory in previous research about IJV control and performance has produced conflicting results. Thus an integration of multiple approaches to enhance better understanding of IJV control and firm's competitive strategy necessary (see e.g. Yan & Gray, 1994; Kogut, 2002). As Parkhe (1996: 451) states: "While each theory provides a useful lens, no theory alone is sufficient to encompass the complexity of JVs". Therefore, in the present study resource dependence theory and organizational learning theory are applied to investigate thoroughly relationship between parent control strategies in their obtaining competitive advantage.

4. Parent firm control strategies in obtaining competitive advantage

4.1 Parent control strategy in IJVs to obtain competitive advantages by gaining skills through knowledge acquisition from local firms

IJVs involve the contribution and leverage of both resources and skills. The traditional management focus is concentrated on acquiring and control visible assets. In IJVs, lack of attention to the accumulation of skill may erode the competitive advantage derived from the venture. Removing the organizational obstacles to learning by loosening control is strategic priorities of parent control and its involvement in the design and management IJVs. Narrow control is essential for learning and knowledge acquisition to take place (Inkpen & Culllen, 2004; Mona & Usha, 1997). Inkpen and Cullen (2004) point out that social controls that involve interactions between partners and personal friendship between managers create the opportunities for firms to learn about each other's skills. Lyles and Salk (1996) found that IJVs with equally shared ownership control had significantly higher levels of knowledge acquisition than majority controlled IJVs. Social control promotes inter-organizational learning by enhancing partner's trust and providing

medium through which knowledge can be transferred (Lyles, Doanh, & Barden, 2000). Makhija and Ganesh (1997) maintain that social control promotes social interactions through informal communication, team meeting, and training. Parent control, in addition, needs to focus on personnel exchange so that it can have a positive impact on the amount of accumulated knowledge.

Proposition 1: Parent firms entering into IJVs to achieve competitive advantage through gaining skills from local firms are more likely to use a narrow, social, and loose form of control over the IJV.

4.2 Parent control strategy in IJVs to obtain competitive advantage by gaining access to local firms

The primary motive for foreign parent firms forming IJV is to *gain access* to a local firm's proprietary resources including both firm-specific knowledge and country specific knowledge. Whilst, local firms may lack management know-how and technology (Luo et al., 2001), they often contribute their country specific knowledge, land, and manufacturing facilities (Killing, 1983). According to resource dependency theory, if the access that local parent firms contributing to the IJVs have is critical to the IJVs success, the local parent firms have a better position from which to negotiate for more control over IJVs (Mjoen & Tallman, 1997). Thus, they leave foreign firms less control in the IJVs. Foreign firms, as a result, acquire their control through *social control* and by concentrating their control on the areas where they contribute most to the IJVs. Thus we propose:

Proposition 2: Parent firms entering into IJVs to achieve competitive advantage by gaining access from local firms proprietary resources are more likely to use a narrow, social, and loose form of control over the IJV.

4.3 Parent control strategy in IJVs to obtain competitive advantage by gaining economics of scale and scope

Another way for a foreign parent firm to enter IJVs with local firms is to achieving competitive advantage through *gain economies of scale and scope.* For this purpose, foreign parent firms are often manufacturing firms and they just expect the local parent firms to merely supply them with cheap labor, and existing facilities such as land and/or a factory (Killing, 1983). This contribution by local parent firms can simply help to reduce the production costs of the IJVs (Kogut, 1988). For foreign parent firms entering into IJVs with this motive, the most important issue is the quality of the product of the IJV (Chalos & O'Connor, 1998). In addition, the success of a joint venture depends on the fit between the parent criteria for success and how well the parent control specific activities related to its criteria for success (Schaan, 1983). Thus, foreign parent firms may narrow down their control to focus on the quality issue of the IJVs' output. Furthermore, by focusing their control on some specific activities and loosening control over the rest of the IJV activities for local parent firms, foreign parent firms give incentives for local parent firms more chance to involve in and contribute to the activities of the IJVs. Giving up overall control and maintaining formal control in just some key areas of the IJV also helps to reduce the costs associated with excessive control. This may help to reduce the level of conflict and increase the cooperation between foreign and local parent firms. As a result, we propose:

Hypothesis 3: Foreign parent firms entering to IJVs to achieve competitive advantage by gaining economies of scale and scope are likely to exercise formal, narrow, and loose control over their IJVs.

4.4 Parent control strategy in IJVs to obtain competitive advantage by to gaining market position

As aiming for achieving market position in the countries where IJVs operate, commitment and cooperation from the local partners are more important. Because foreign parent firms are probably not familiar with local tastes and local unique customer needs. The knowledge of the host environment provided by the local partners may enable suitable adaptation; and bring advantages to the IJVs (Johnston, 2005). Previous research also points out that less control from the foreign parent firms, and more influence of the local parents, are factors necessary for better performance of IJVs (Li, 2003). This is especially important in those countries such as China where the local governments play an important role in joint venture activities (Beamish, 1993). Information about the local economy, politics, culture and business customs, consumer's demands and tastes, the labor force, infrastructure, raw materials, and other factors required for the operation of joint ventures are likely to be delegated to the local partner (Makino & Delios, 1996).

In addition, Bai, Tao, and Wu (2003) found that if the sales of the IJVs' products are mainly focused on local markets, the control of the foreign parent firms decreases with the need for local marketing knowledge of their products. This is because the IJVs in the countries like China are often a marriage of foreign technologies and local markets. In this context, the marketing expertise for local markets is often an important contribution of the local partners, while the technological sophistication is an equivalent provided by the foreign partners. Therefore, the foreign parents oriented towards the local markets are likely to exercise less control over the IJVs because the resources important to them are obtained with the help of the local partners (Calantone & Zhao, 2001). As a result, we propose:

Hypothesis 4 To achieve competitive advantage through gaining market position in the countries where IJVs operate, foreign parent firms prefer to exercise a narrow, loose, and social control over the IJVs.

5. Methodology

5.1 Method and measurement

This study adopted a survey research design to fit with the exploratory nature of the research. In the survey, the

questions about joint venture control and components of competitive advantage were collected directly from those involved in IJV operations. Furthermore, to be able to generalize conclusions about the joint venture control, a large number of IJVs is needed to be examined. This made direct interviews very costly in terms of time and money and impractical so that to achieve the desired sample size. The measure of variables is based on a 5 point-scare. Concerning control measurement, a list of different control mechanisms, focused on areas of IJV activities were provided, the respondents were asked to evaluate their control with 1= always used to 5= never used. The methodologies used in this study to analyze the data are description statistics and the Chi-square test. The purpose of the methods is to determine how well an observed set of data fits an expected set of hypotheses. These methods are used to examine the differences with categorical variables. The method is particularly useful to find out whether an IJV control structure which is made by different elements of IJV control dimensions (formal, social, broad, narrow, tight, and loose) has a normal distribution or there is particular structure forming to promote foreign parent firms to achieve competitive advantages.

5.2 Sample description

The study herein is a part of an on-going research project focusing on IJV behavior, strategies, partner selection, control structure, and performance of Finnish firms. The target firms and investments were identified as follows 1) the FDI data base collected by the project leader starting from late 1980s based on press releases regarding IJVs published on leading business magazines and newspapers and 2) annual reports and websites of the 250 largest Finnish firms from the leading magazines; 3) based on the earlier surveys focusing on IJVs and WOS by Finnish firms conducted by the project leader. From the resources, we identified 340 IJVs qualifying for our study; they were founded by 200 Finnish parent firms since 1988 and in operation at least until 2002. Among these 200 firms, several firms were very difficult to contact either because they had been restructured or gone out of business. While researching for informants, we found that in some firms there was no longer anyone with sufficient knowledge required for the study. This left a total of 161 Finnish parent firms. Given the time and cost constraints a postal questionnaire and online web survey were used to gather the data. The participants were those managers who were directly involved into the IJV's establishment and operations.

To enhance the quality of the data, the respondents were contacted by phone in December 2006 to explain the key points of the study and the questionnaires. In exchange for their participation in the study and to ensure accurate responses, the respondents were assured of their anonymity and were promised a summary report of the findings and participated in a draw for three gifts. After one reminder at the end of January 2007, at the end of February, 54 questionnaires were returned from which 5 questionnaires were not usable. Thus, the final sample was 49 IJVs including 40 Finnish parent firms. The response rate was 24.84%, which is relatively similar to that of earlier respective studies in Finland (see Larimo & Rumpunen, 2006). The sample was carefully examined for any systematic response bias using t-tests. Respondents and non respondents were compared across their age, size, international experience, and IJV experience. No statistically significant difference was found. Thus, there was not response bias to be found in the final sample. Among the 49 IJVs of the final sample, 45% were established in 1988-1995, 55% in 1996-2006; 53 % through acquisitions, 47% through greenfields, 76 % were with 2 partners and 24 % with 3 partners; 61% with indefinite duration, 22% with less than 5 years, 17 % more than 5 years; 41 % with 10%-49% Finnish ownership, 10% with equal ownership, 49 % with Finnish major ownership at establishment; 71% located in emerging economies, and 29% in developed economies; 63% with industrial products, 27 % with consumer products, 10 % with both consumer and industrial products. The summary of the operationalization of the key variables of the study is presented in the appendix.

6. Results

The empirical data has been analyzed based both on descriptive statistics and on testing statistics. The results are shown in table 1.

6.1 Parent control strategy in IJVs to obtain competitive advantage by gaining skills through knowledge acquisition from local firms

When asked to consider their intent to obtain competitive advantage in IJVs, 33 respondents mentioned that they intent to gain skills through knowledge acquisition from local firms. Of these 33 responses, almost 76% of the companies concerned exercised social control, and about 69% were found to exercise narrow and loose control over their IJVs. In addition, based on the chi-square test, $x^2= 13.15$ the result was significant at $p<0.05$ (df=5) (see table 1.). Thus, the results support hypothesis 1 by both description statistics and chi-square test.

6.2 Parent control strategy in IJVs to obtain competitive advantage by gaining access to local firms

Of 49 respondents, 18 mentioned their main strategic motive in entering to IJVs to obtain competitive advantage by gaining access to local firms. Of these 18 respondents, almost 90% exercised narrow control, over 80% exercised loose control, and almost 80% exercised social control over their IJVs. In addition, table 1 shows statistically positive relation between this gaining access strategy and narrow, social, and loose control structures. Thus, the result supports the hypothesis 2.

6.3 Parent control strategy in IJVs to obtain competitive advantage by gaining economics of scale and scope

There were 31 firms who mentioned their intention of entering IJVs to obtain competitive advantage by gaining economies of scale and scope. Of these 31 firms, more than 80% of foreign parent firms used formal control, and about 70 % of parent firms used narrow and loose control with their IJVs. Table 1 also shows statistically positive relation between foreign parent firms' intention to gain economies of scale and scope in IJVs and their control structure: narrow, formal, and loose control. Thus, the result supports hypothesis 3.

6.4 Parent control strategy in IJVs to obtain competitive advantage by to gaining market position,

There were 23 respondents mentioned their focus on is to gain market position in local partners' markets. Among these, 19 (82%) exercised formal control, 16 (70%) employed narrow control, and 14 (61%) used loose control in their IJVs. Based on the chi-square test, $x^2= 15.74$ the result was significant at $p<0.01$ (df=5) (see table 1.). Thus, the results support hypothesis 4 by both description statistics and chi-square test.

Insert Table 1 Here

7. Conclusion

The present study offers a valuable insight into how to achieve competitive advantages through the use of proper control structure by the foreign firms. The presented set of hypotheses may prove very useful, since the ability to adapt control strategy of parent firms toward subsidiary task, strategic motive: the creation of their competitive advantages has become critical (Chalos & O'Connor, 1998; Feldman, 2004; Govindarajan & Fisher, 1990; Johnston, 2005). The aim of this study was to find out *how parent firms configure the control structure in their IJVs to gain competitive advantage.*

The results show that to achieve competitive advantages through IJVs, foreign parent firms need to narrow down and loosen their control to some key areas of IJV operations such as human resources control, effective communication control. In addition parent strategic control agenda for IJVs must be centered on the process of learning and acquiring new skills and resources. In cases of aiming to achieving competitive advantages through accessing local firm ´s resources, and to acquiring local skills and knowledge, foreign parent need to exercise social control mechanisms over their IJVs. In contrast, in cases of aiming to achieving competitive advantage through gaining economies of scale and scope, and through gaining market position, foreign parent firms need to exercise formal control mechanisms over their IJVs. The present study concludes that, in order to achieve successfully competitive advantages such as acquiring new skills, accesses to local firms resources, gaining economies of scales and scope, and gaining market position in foreign countries, the foreign parent firms need to have comparable IJV control structures that fit with their intended competitive advantages that they want to achieve when entering IJVs. This study is believed to contribute significantly to IJV theory since it is the first to attempt to link parent firms control and competitive advantages obtaining. Or in other words, this study is the first to examine how parent firm can realize their competitive advantages through exercising proper control structures over their IJVs.

We also acknowledge several limitations to our study. First, the sample size of the study is rather small and only from Finnish IJVs. For further studies, researchers could use the framework of the present work with a bigger sample size and foreign parent firms from several countries. In addition, because IJVs evolve overtime, further studies are also needed to investigate the dynamic of the parent control over IJVs to achieve competitive advantages along the IJV's life cycle. Furthermore, qualitative study such as case study which allows researchers to investigate the issue more deeply insight is great of interest. Finally, when discuss about the control of IJVs, the present study exclude the role of local firms. However, control of IJVs is an agreement between foreign firms and local firms, thus future study may include the role of local firm control of IJVs in creation of competitive advantages.

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Table 1. The results of the study based on the chi-square test

Hypotheses		X^2	**DF**	**Results**
Competitive advantage component	**Control structure**			
H1 Accesses to local resources	Narrow, Social, Loose	13.15	5	significant at 0.05
H2 Acquiring local knowledge	Narrow, Social, Loose	17.73	5	Significant at 0.01
H3 Economies of scale & scope	Narrow, Formal, Loose	12.70	5	significant at 0.05
H4 Market position	Narrow, Formal, Loose	15.74	5	Significant ar 0.01

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The Effect of Exchange Rate Disequilibrium and Financial Integration on Economic Growth

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Abstract

We identify the determinants of the equilibrium real exchange rates (RER) in 10 selected countries of South and South East Asia and estimate the RER distortion by testing the effect of international financial integration (IFI) on economic growth. We use a simple model that determines the equilibrium RER and a dynamic model of endogenous growth that traces the effect of the RER distortion. We applied the techniques of non-stationary dynamic panel, the tests of panel cointegration, and the method of least squared dynamics (DOLS) to estimate the relationship of cointegration. We also use the technique of Generalized Moments Method (GMM) in the system as applied to panel data to estimate the equation of dynamic growth. The IFI constitutes an important factor of long-term RER. An increase of it led to a long-term RER depreciation in the region. The evolution of the RER distortion for 1979-2004 was persevering and recurring: it was an alternation between periods of RER overvaluation and undervaluation in the region. The RER fluctuation in the short-term played against economic growth.

Keywords: DOLS, Economic Growth, Equilibrium RER, GMM of Dynamic Panel, International Financial Integration, Panel Cointegration, RER Distortion.

JEL Classification: F33, F36, O24 and O53

1. Introduction

The period after Bretton Woods has witnessed major instability of currencies and real exchange rates (RER) fluctuations, particularly in the emerging economies. The RER instability inhibited growth in some countries of Latin America while the expansion of South East Asian economies is largely attributable to the relative stability of their exchange rates. Some studies indicate that an overvaluation is not favorable for producing tradable goods and services, and sometimes it leads to monetary crisis. However, there are also studies that claim a positive relationship between the RER variability (depreciation or undervaluation) and an improvement of economic performances, stimulation of growth, and increase in exports. But, an excessive overvaluation tends to slow down growth and undervaluation tends to accelerate it. There does not seem to be a linear relationship between RER misalignment and economic growth.

With the integration of the majority of emerging economies in a process of international financial and commercial liberalization, recent literature pays considerable attention to the Equilibrium Real Exchange Rate (ERER) and RER misalignment. However, limited literature is available in the area of formalization of the relationship between RER variability and growth, particularly in the new context of financial integration.

The international financial liberalization that accompanied the collapse of the Bretton Woods system and the adoption of flexible exchange rate system (Eatwell, 1996) is characterized by the elimination of the capital movements control and the deregulation of domestic financial markets (Mussa and Goldstein, 1993). As a result, there is a reduction of barriers at the level of foreign direct investments (FDI) and of international trade (Obstfeld 1998 and Baldwin and Martin, 1999). Such economic policy in favor of financial liberalization entailed unexpected consequences relative to the political instabilities in some countries (Blecker, 2005). This new context engendered commercial imbalance, repeated financial crisis, and related business cycles on the international horizon, especially an external RER variability as well as persevering distance to the PPP (Reinhart and Smith, 2001 and Stiglitz, 2002, and Krugman and Obstfeld, 2003). But, the analysis of the effect of IFI on Equilibrium RER (ERER) remains inadequate, particularly for emerging economies.

Our objectives are to identify the determinants of the equilibrium RER in the South and South East Asian (SSEA) region, to estimate the RER misalignment by testing in particular the long-run effect of international financial

integration (IFI), and to determine the effect of RER variability on the level of economic growth. We use a simple model that determines the equilibrium RER, and a dynamic model of endogenous growth that traces the effect of the RER misalignment. We applied the techniques of non-stationary dynamic panel proposed, the tests of panel cointegration, and the method of least squared dynamics (DOLS) to estimate the relationship of cointegration. We use the technique of Generalized Moments Method (GMM) in the system as applied to panel data to estimate the equation of dynamic growth.

2. Review of Literature

2.1 Exhange Rate Behavior and Financial Integration

In spite of the rarity of works examining the effect of IFI in the long-term RER, this issue does not turn out to be recent. Bruno (1976) shows that the effect of any liberalization depends on the interest rate prevailing before the liberalization, and the level of depreciation of the adjusted foreign exchange rate. When domestic interest rate exceeds the depreciation of foreign adjusted rate, further to an elimination of the control on capital movement, the RER begins to appreciate if there is an excess domestic demand, and a deficit of the current account. Consequently, there is an initial period of real appreciation, but a real depreciation in the long run. Obstfeld (1984) shows an initial period of real appreciation, and a real depreciation in the long-term due to the liberalization of capital. He also shows that with the demand transfer towards domestic production, a RER increase leads directly to an increase of the imports of intermediate products. The effect of the variation of relative prices is connected on the Marshall- Lerner condition that assumes a real depreciation of exchange rate with a positive effect on the current account, i.e. a RER depreciation (appreciation) is accompanied with a surplus (deficit) of the current account.

Hooper and Morton (1982) and Gavin (1992) present the relationship between Net Foreign Asset (NFA) and RER. Hooper and Morton (1982) develop a model in which exogenous shocks of trade create, in the long run, a positive correlation between NFA and RER. In a more complete theoretical model, Gavin (1992) shows that exogenous shocks of wealth entail a positive correlation between NFA and RER, if the condition of Marshall- Lerner is satisfied. The idea is that in equilibrium a country having a negative NFA must have a trade surplus to finance the payment of interest and dividends of these foreign assets. The mechanism used to produce this surplus is the RER depreciation. Any NFA shocks may affect the long-term RER.

Engel and Rogers (1999) formulate a dynamic model of general equilibrium indicating that after the financial liberalization in countries with weak capital trade deficits must be followed by trade surpluses. But the initial trade deficits and the RER appreciations have to come along with the RER depreciation and a trade surplus.

Lane and Milesi-Feretti (2001) develop a model of inter-temporal optimization where the prices of non-tradable goods are endogenous. They link RER and debt by controlling variables such as the terms of trade and productivity (Balassa-Samuelson effect). They conclude that creditor countries (developed) have appreciated RER while the debtor countries (developing) have depreciated RER. The result obtained by Lane and Milesi- Ferreti is confirmed by those of Ganelli et al. (2002) and Breton (2004).

Egert et al. (2004) and Benassy-Quéré et al (2004) show that in the long run, the NFA is reached its desired level. An improvement of NFA leads to RER appreciation because it implies an increase of the entries of incomes. Countries with a negative NFA stock (that seems to be the case of transition economies) register a current account deficit and a real appreciation. However, in the long run, the desirable NFA level can be realized. The payments of foreign debts stocks modify completely the link: more the foreign debt stock is raised; more the necessity of RER depreciation arises to maintain the debt by an improvement of the commercial account, and vice versa.

Obstfeld (1984) suggests that in the long term liberalization entails inevitably RER depreciation. However, in Chile, the real appreciation preceded the suppression of external financial limitations (Edwards 1989a). Hooper and Morton (1982). Faruquee (1995), Obstfeld and Rogoff (1995), and Gagnon (1993) confirm a positive relationship between NFA and RER.

Burgess and Mawson (2003) find a positive relationship between NFA situation and RER for three Baltic States: a decrease (increase) of NFA led to RER appreciation (depreciation). Alonso-Gamo et al., (2002) maintain the same conclusion for Lithuania, Czech Republic, Hungary and Poland. On the other hand, Hinnosar et al. (2003) indicate a negative sign for Estonia. It is the same for Rahn (2003) for the Czech Republic, Estonia, Hungary, Poland and Slovenia. In other words, a decrease (increase) of NFA position drives to RER depreciation (appreciation). Alberola (2003) also arrives at the same conclusion for Hungary and Poland and his conclusion is confirmed by Csajbok (2003) and Bitans and Tillers (2003).

Bénassy-Quéré et al. (2004) provide the long term effect of NFA on RER for the G-20 countries for 1980 - 2002. Using a panel cointegration technique, they find a fall of NFA in emerging economies engendering a real RER appreciation in the second half of the period. Égert, Lahrèche-Révil and Lommatzsch (2004) following the same technique show that an improvement of NFA position leads to a real appreciation in the small open economies of the OECD.

Lane and Milesi-Ferretti (2005) examine interactions between financial globalization and RER. In their estimations, they use assets and the external commitments of a sample of emerging economies and estimate the deterioration of the net foreign asset situation during periods of debt crisis. They provide evidence for stabilization of the NFA position for 1990-1996. They indicate a deterioration of the NFA situation caused by the decline of GDP and the RER depreciation characterizing the SSEA crisis. Countries accumulating substantial net assets include Indonesia, Korea, Malaysia, Thailand, and Russia.

2.2 Real Exchange Rate Misalignments and Economic Growth

With RER misalignment, the current exchange rate of a country deviates in the long run from its reference level or from desired equilibrium level. This phenomenon constitutes an important source of macroeconomic disequilibrium where correction is one of the important conditions to improve economic performance and to assure macroeconomic stability. In this context, Terra and Valladares (2003) underline that the persistence of this phenomenon generates macroeconomic imbalance that in turn requires costly external corrections. The main problem of the emerging economies that contributed to poor performance is not the RER volatility, but the overvaluation of their currencies and the adoption of inappropriate exchange policies (Amor and Sarkar (2008)).

The RER misalignment, with weak relative prices, results in a decline of the industry profitability (Ghura and Grennes (1993)). The RER disequilibrium often takes the form of an overvaluation of the domestic prices that may adversely affect international trade of goods and services. Consequently, the balance of payments and the external competitiveness of exports get affected. Dollar (1992) showed that the misalignment could entail lowering economic efficiency and cause capital flight. Inefficient resource allocation engendered by distorted domestic prices relative to international prices has an unfavorable effect on domestic investment. Misalignment can affect both domestic and foreign investment, and the process of capital accumulation. Giersch (1985) suggests that an emerging economy should profit by undervalued RER to assure its process of development.

According to Lahrèche-Révil and Guerin (2001), there is an evidence of the influence of competitive prices on growth as they promote exports and FDI. Shatz and Tarr (2000) suggest that there are canals by which a RER overestimation may adversely affect growth.

3. The RER Determination

Equilibrium Real Exchange Rate (ERER) is explained by its various determinants. The major determinants include public spending (Aguirre and Calderon, 2006); excess supply of domestic credit (Edwards, 1989a); trade opening effect (Baffes et al, 1999); Balassa-Samuelson effect (1964); terms of trade effect (Elbadawi and Soto, 1997), and effect of a change in foreign financial assets and capital flows (Lane and Milesi- Ferretti, 2006).

3.1 Reduced ERER Equation and Sources of Data

It is important to study the long-term relationship between RER and its determinants and to measure distances as possible RER distortions (Amor and Sarkar (2009)). The RER is defined as follows:

$$RER = \frac{P}{E.P^*}$$

where, P indicates domestic price index measured by the consumer price index, P* represents foreign price index measured by the consumer price index of the United States, E is represents nominal exchange rate defined as the number of domestic monetary units that exchange against a foreign monetary unit. So, our definition of RER implies that an increase (decrease) of RER means a real appreciation (depreciation).

By using logarithms Niperien, we rewrite the RER as follows:

$$rer = p - e - p^* = (p_e - e_e - p_e^*) + (1-\gamma)(p_{ne} - p_{ne}) - (1-\gamma)(p_{ne}^* - p_{ne}^*)$$

$$= x_t + y_t$$

where, γ indicates the part in total domestic dispenses of tradable goods.
Following the RER decomposition of Engel et al. (1999). we use $x_t = p_{et} - e_t - p_{et}^*$, the relative price of tradable goods and $y_t = (1-\gamma)(p_{nt} - p_{et}) - (1-\gamma)(p_{nt}^* - p_{et}^*)$, the relative price of non-tradable goods, x_t as a stationary process, y_t at the origin of a non-stationary behavior of RER. This last item can be due to some shocks such as technological shocks, demand, and terms of trade.

We developed the following logarithmic function for RER determination:

$$rer_{ij} = \beta_0 + \beta_1 tt + \beta_2\, dprod_{it} + \beta_3 ps_{it} + \beta_4 mon_{it} + \beta_5 open_{it} + + \beta_6 ifi_{it} + \varepsilon_{it},$$

$$i = 1, 2, 3..., N \quad et \quad t = 1, 2, 3..., T$$

where, rer indicates actual RER; te, the term of trade; *dprod*, the productivity differential; *ps*, the level of public spending in GDP; *mon*, the currency (money); trop, the trade opening; and ifi, a measure of International Financial Integration (IFI).

We also use the annual effective RER (EFRER) defined as the annual index of domestic prices (consumer price index) for a country (i) toward the annual index of the prices of main trading partners, multiplied by the nominal exchange rate of the country (i).(Note:1)

Our analysis is based on a panel of 10 countries of SSEA (Bangladesh, China, India, Indonesia, Korea Rep, Malaysia, Pakistan, Philippines, Sri Lanka, and Thailand). The period of study is 1979-2004. We adopted some estimates because of the problem of availability of some economic indicators. The first is related to public spending of non-tradable goods, as we cannot decompose it into tradable and non-tradable goods. We use the part of global dispenses in income, as a proxy. For the Balassa-Samuelson effect, we used the differential of growth rates in GDP. Another approximation concerns the trade policy that is determined by the part of the foreign trade in income. In our case, we use the part of total imports and exports in total domestic dispenses.

The variables of nominal exchange rate, IPC, GDP per capita, public consumption, the terms of trade, and trade openness are from WDI (2006). Data are also obtained from IMF CEDROM (2006), the Statistics of Balance of Payment (2005) and GDF (2006). The data on variables measuring international financial integration are from database of Lane and Milesi-Ferretti (2006).

4. Growth Model Specification and Methodology

We empirically estimate the impact of the RER variability on economic growth by adopting the panel dynamic approach and the estimation method of Generalized Moments Method (GMM). We refer to the empirical studies of Barro (1999) and Islam (1995).

4.1 Variables

Our growth model in logarithmic form includes the following variables for which data are obtained from WDI (2006), except the ones indicated below. The dependent variable is the growth rate of real GDP/capita (constant $ of year 2000) as *ΔLnY*. Independent variables are classified in the following three groups:

Structural Policies

- Stock of human capital (*LnHK*) in mean number of schooling years of population from ages 15 to 64. Data interloped from observations over 10 years from Cohen and Soto's database (2007).
- Indicator of financial development *(LnFD)*: Domestic credit of private sector in % of GDP.
- Export *(LnX)*: Export in % of GDP.
- Indicator of capital inflows *(LnFDI)*: FDI net flows in % of GDP.
- Indicator of the government size *(LnPS)*: Public spending in % of GDP.

External Shock

- Indicator of external shock: Terms of trade *(LnTT)*.

Stabilization Policies

- Indicator of RER Volatility (VORER - standard deviation of RER variation)
- Indicator of RER Misalignment (*MISRER* - distance between observed RER and ERER).
- Indicator of International Financial Integration (IFI). According to Milesi-Feretti et al (2006), there are three indicators- the total of commitments and assets reported as GDP (IFI1), the sum of IDE, and portfolio investment stocks reported to GDP (IFI2) and the position of Net Foreign Asset (NFA) considered as an alternate indicator of IFI measured as the difference between the total of assets and commitments (in absolute values).

The growth equation is, therefore, as follows:

$$\Delta Lny_{i,t} = \alpha_i + \beta_0 \underset{(+)}{Lny_{i,t-1}} + \beta_1 \underset{(+)}{LnHK_{i,t}} + \beta_2 \underset{(+)}{LnX_{i,t}} + \beta_3 \underset{(+)}{LnFDI_{i,t}} + \beta_4 \underset{(-)}{LFD_{i,t}n} + \beta_5 LnPS_{i,t} +$$
$$\beta_6 LnTT_{i,t} + \beta_7 \underset{(+/-)}{LnIFI_{i,t}} + \beta_8 \underset{(-/+)}{VOLRER_{i,t}} + \beta_9 \underset{(-)}{MISRER_{i,t}} + \varepsilon_{i,t} \qquad \underset{(-/+)}{} \qquad \textbf{(1)}$$

where,

α_i = the fixed or specific effect of the country that allows to get the effect of no observed factors determining growth , β = *the parameters*, $\varepsilon_{i,t}$ = the term of error, and, *i and t* = the indications of the country and time, respectively.

Models of growth theory imply that a rise of physical or human capital (Levine and Renelt, 1992) and of the openness of an economy (Berg and Krueger, 2003) entail an increase in economic growth. The financial deepening of an

economy or the level of development of the financial sector has also positive effects on growth. The term of trade being an important trade determinant contributes to the level of economic growth. The RER volatility plays against growth (Edwards, 1989 and Dollar, 1992) while, for misalignment, the sign is mitigated. Indeed, an overvalued RER hinders growth. On the other hand, an undervalued RER increases growth rate. Finally, the exchange system and the IFI are also important factors of economic growth.

4.2 Estimation Technique

We use the Generalized Moments Method (GMM), as indicated earlier. According to Arellano and Bond (1991). this method allows resolving problems of simultaneity bias, causality inverse, and omitted variables (Kpodar, K., 2007). This procedure presents several advantages relative to other methods of panel dynamic models. It allows elimination of bias generated by omission of some explanatory variables. Furthermore, the use of an instrumental variable allows better estimation of the parameters because explanatory variables such as trade opening ratios or investment rates are conceptually endogenous. It allows significant results even in the case of measurement errors (Note: 2).

5. Interpretation of Empirical Results

We test the integration order of our series. As indicated in Table 1, the tests of panel unite root according to Im, Pesaran, and Shin (2003) confirm that our series are integrated of order one.

Panel cointegration tests of Pedroni (2004) provide evidence for the existence of cointegration relationship that enters ERER and its major variables for the 10 selected countries of South and South East Asia. All statistics with the exception of panel statistic υ reject the null hypothesis of absence of cointegration between RER and its fundamental variables for our sample. Table 2 shows the results.

Compared with the critical value of 1.6445 at the level of 5 %, the majority of the statistics confirm the existence of a long-term relationship for these countries. This relationship can be estimated by the Dynamic Ordinary Least Squares (DOLS) method (Note: 3).

5.1 Estimation of long run relationship and interpretation of results

The technique developed by Pedroni allows testing the existence of a cointegration relationship between RER and its fundamental variables, but it does not allow estimating the vectorial model of correction errors. If these tests indicate that variables are cointegrated, it will be possible to use several methods to estimate parameters such as Pooled Mean Group estimator developed by Pesaran et al (1999), and the Fully Modified Estimator developed by Pedroni. In our evaluation, we refer to the DOLS developed by Kao and Chiang (2000) (Note: 4).

According to DOLS, our formulated model (Amor and Sarkar (2009)) is as follows:

$$erer_{it} = \alpha_i + \varphi_t + \beta_1\ tt_{it} + \beta_2\ dprod_{it} + \beta_3\ ps_{it} + \beta_4\ mon_{it} + \beta_5\ open_{it} + \beta_6\ ifi_{it} + \sum_{k=-q}^{k=q} \upsilon_{1k} \Delta tt_{it+k} +$$

$$\sum_{k=-q}^{k=q} \upsilon_{2k} \Delta dprod_{it+k} + \sum_{k=-q}^{k=q} \upsilon_{3k} \Delta ps_{it+k} + \sum_{k=-q}^{k=q} \upsilon_{4k} \Delta mon_{it+k} + \sum_{k=-q}^{k=q} \upsilon_{5k} \Delta open_{it+k} + \sum_{k=-q}^{k=q} \upsilon_{6k} ifi_{it+k} + \varepsilon_{it}$$

The number of lags and leads is chosen according to the Schwarz criterion. The long-term coefficients of the cointegration equation are important for our purpose. Table 3 provides the DOLS estimation results.

The cointegration coefficients relative to the measures of international financial integration (IFI) confirm our predictions (Hooper and Morton, 1982; Obstfeld, 1984; Gavin, 1992). We provide evidence of a long-term effect of RER depreciation of IFI for the region of SSEA. It is the net foreign asset (NFA), which we can retain as IFI's measure.

According to Table 3, a rise of 1 % of nfa indicator leads to the RER depreciation of 0.18 %, compared to 0.14% without Bangladesh and Pakistan in the sample (Amor and Sarkar (2009)). This effect of long-term RER depreciation is explained by the fact that further to positive shock carrying on financial integration parameter. An overvaluation of the RER seems to be necessary to cover the current account deficit of the short term and the Marshall-Lerner condition comes true in the case of SSEA countries. On the other hand, the middle term is characterized by the adjustment of NFA at their desired level. The region seems to have a negative NFA stock; it shows a deficit of the current account and an appreciation of the RER. In the long run, the desirable level of NFA justifies the increase of foreign debt stock that increases the RER depreciation to assure this debt service by the improvement of the current account.

Our results confirm that an improvement of the terms of trade entails an RER appreciation in this region, which implies that the wealth effect dominates the substitution effect in emerging countries. Indeed, an improvement of 1 % of terms of trade entails an appreciation of 1.12 %, compared to 1.04% without Bangladesh and Pakistan (Amor and Sarkar (2009)). The productivity differential does not contribute to long term RER variations in the region. This can be

explained by the poor approximation of the Balassa-Samuelson effect. Moreover, the sign of the coefficient of *dprod* is not expected. The effect of public spending on RER is positive and it is statistically significant (at 1 %). Indeed, a positive shock on public spending engenders a long-term RER appreciation that confirms our expectation that a rise of global demand of non-tradable goods leads to an increase in prices. The effect of the monetary variable on long-term RER depends on applied policies in this group of countries. A positive shock of the currency supply entails currency depreciation. This result can be explained by the adoption of a policy of expansionist domestic credit that is susceptible to undervaluation of the RER in the region. Negative coefficient corresponding to the variable of trade opening indicates that commercial liberalization is accompanied with depreciation of the RER.

5.2 Determination and evolution of misalignment

The misalignment is calculated as follows:

$$MIS = RER - RER^{p} = RER - X^{P}\beta$$

where, X^{P} is the permanent composition that represents the trend of RER fundamental variables. If the distance is positive (negative), we observed over (under) valuation of local currency. Figure 1 presents the evolution of RER distortion in the 10 selected countries of the region. We observe an alternation between the episodes of overvaluation and undervaluation during the period of study. The determination of RER misalignment by our model confirms this evolution for the panel countries. There are persevering and recurring episodes of misalignments. These episodes take the form of undervaluation for the majority of the countries (China, Indonesia, Korea, Malaysia, Philippines and Thailand) and late 1990s experienced overvaluations. Such result is a consequence of the SSEA crisis in 1997-1998. Indeed, countries of the region are marked during the 1990s, especially from 1994 by the massive entry of capital flows that contributed to inflationary condition. This situation engendered an effective RER appreciation of more than 25 % over the period for 1990-96 and a very grave deficit of current account payments balance. Consequently, there is a loss of competitiveness of most of the region, notably Thailand, where its currencies are more or less attached to dollar. Such a situation is attributed to a fall of yen in 1997 and an immediate depreciation of the bath that exceeded 50 % relative to the dollar.

5.3 RER Misalignments and Economic Growth: Empirical Analysis of Data from 10 SSEA countries

Table 4 shows the results of regression analysis that we carried out for the 10 countries. Our tests of Sargan/Hansen verify the validity of lagged variables as instruments. Furthermore, the autocorrelation tests of Arellano and Bover (1995) do not reject the absence of second-class autocorrelation.

We estimate three growth equations. The first one includes all the explanatory variables of economic growth. The second equation improves the first one deleting the variables, which are statistically not significant such as financial development and public spending. In the last equation, we try to test nonlinear effect of RER misalignment and to estimate if RER overvaluation and undervaluation have a different impact on economic growth of SSEA countries. In other words, we test the following hypothesis: RER overvaluation damages the economic growth while undervaluation can improve it. For this, we have created a variable D_t that takes value of 1, if RER is overvalued, and 0 if not. The two variables of overvaluation and undervaluation are defined, respectively, as:

$$MIS_{+} = (RER - ERER)\, D_t \quad \text{and} \quad MIS_{-} = (RER - ERE)\,(1 - D_t)$$

We modified the basic regression model by enclosing the variables of undervaluation and overvaluation instead of the RER misalignment. Noting that MIS_{+} (MIS_{-}) take positive values (negatives) if RER is overvalued (undervalued), and 0 if not.

The level of economic growth of the SSEA countries is explained essentially by their export strategy, the terms of trade, and by their trade policy. In particular, the effects of exports and terms of trade seem to be significant in the three estimated equations at 1 % and 5 % respectively. Several countries of such as South Korea, China, and Malaysia adopted development primarily following export promotion strategies based on commercial opening than depending on FDI. Their price stabilization policy was also helpful.

Figure 2 shows the evolution of the growth rates of GDP/capita in the region. In South Asia, although the growth rate of Bangladesh remained at a lower level than that of India and Pakistan, its rate grew steadily over the years. However, Sri Lanka's rate remained more or less the same. Compared to Bangladesh, India, Pakistan, and Sri Lanka are significantly diverse in terms of ethnicity, language, and religion. These countries often struggle with separatist movement and violence. Their GDP growth rates fluctuated more than those of Bangladesh. On the other hand, except Philippines, the growth rate fluctuation of South East Asia showed similar pattern.

Our results also show that the short-term fluctuation of RER plays against economic growth. The effect, in the three equations (Table 4) is statistically significant at 1%. This indicates the importance of the RER volatility (Amor and Sarkar, 2008) as well as the role of the monetary stability to explain economic growth of the region. Indeed, the currencies of most of our selected countries remained relatively stable relative to the dollar over a long period.

Although we observe a negative effect of key variables on economic growth, the effect is not significant for RER misalignment (equations 1 and 2, Table 4). These results do not confirm most empirical studies (Hausman et al (2004)). So how do we verify the non-linear effect of RER distortion on economic growth in this region?

According to our study, undervaluation positively affects the economic growth rate. The effect is statistically significant at 1% and conforms to the result found by Dooley et al. (2003) and Aguirre and Calderon (2006). This result translates the orientation of the sample countries towards undervaluation of their currency in order to encourage the export oriented trade strategies and to increase their growth. On the contrary, the effect of overvaluation is negative and statistically significant at 10% level. This is explained by the alternation between undervaluation and overvaluation. (Chinn, 2005 and Aguirre and Calderon, 2006). There is a non-linear relationship between RER misalignment and economic growth.

We also show the negative effect of the new financial situation on economic growth in the region. Although the IFI variable has a weak coefficient, its effect remains unfavorable to economic growth. This seems to be due to the choice of the fixed exchange rate adopted by several countries. Such a choice, however, is incompatible with the new financial context characterized by a greater international financial integration (Amor and Sarkar, 2008). The human capital, although its effect is statistically significant, it is unexpected in theory. This result can explain by the relatively weak level of education in the region or by the choice of the explanatory variables.

Finally, the effect of financial development on economic growth remains relatively weak but not significant in the first model. This can be the result of a weak and insufficient development of financial system in order to realize desired economic growth in the region.

6. Conclusion and Recommendation

The long-term RER factors include the terms of trade, the public spending, the monetary policy, and the trade openness. The IFI constitutes a determining factor of long-term RER and that an increase of this leads to a long-term RER depreciation in this region. This confirms predictions of Hooper and Morton (1982). Obstfeld (1984). and Gavin (1992). We confirm the effect of long-term depreciation of the IFI on RER in the SSEA region.

Our analysis shows the evolution of the RER misalignment in the 10 countries of SSEA for 1979-2004. This evolution is persevering and recurring: it is about an alternation between periods of RER overvaluation and periods of undervaluation. These episodes were common in the majority of the countries in the region (Indonesia, Korea, Malaysia, Philippines and Thailand) and are explained by the consequence of the SSEA crisis in 1997-1998.

Our results also allowed us to emphasize the dimension and the nature of relationship between RER variability and economic growth. We confirm that the RER fluctuation in the short-term plays against economic growth and this effect is statistically significant at level of 1%. This result indicates the importance of the RER volatility in the region. For our key variables, we justify the non-linear effect and non-uniform relationship between RER disequilibrium and economic growth. Our result confirms theoretical predictions because the undervaluation effect on economic growth is positive and statistically significant (at the level of 1%), and confirms the result found by Dooley et al (2003), Aguirre and Calderon (2006), and Amor and Sarkar (2009). On the contrary, the effect of overvaluation is negative.

Although the IFI variable is attributed to weak coefficient, its effect remains unfavorable to the economic growth of the region. Such result can be explained by the choice of the adoption of fixed exchange rate in several countries of the region. Our result confirms the incompatibility between exchange rate policies and strategy of international financial integration for economic growth.

The question of the effect of RER variability on economic performance becomes even more central to the pursuit of any economic policy for growth. Our recommendation for the region is to reduce the adverse effect of the RER variability on growth by lowering the dimension of overvaluation with adopting more and more flexible exchange regime and by following a sequential strategy of financial integration that is compatible to its exchange rate systems.

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Notes

Note 1. For more details, see Amor T. H. and Sarkar, A. U. (2009)

Note 2. For more details, see Amor ,T. H. and Sarkar, A. U. (2008)

Note 3. All our results of panel cointegration tests and of DOLS are obtained by the software Rats 6.1. For the tests of panel unit root, we used the Views 5.1. These tests suppose an average relationship for the panel of our sample with unit coefficient of cointegration.

Note 4. Kao, C & Chiang, M.H. (2000).

Note 5.We compare static values with the critical one of 1.6445.

Table 1. Panel Unite Root Test of IPS

Real Exchange Rate			
Level		First Difference	
Constant	Constant with trend	constant	Constant with trend
0.03	-2.12	-17.62	-8.13
Term of Trade			
Level		First Difference	
Constant	Constant with trend	constant	Constant with trend
-4.12	-1.57	-13.12	-6.82
Productivity Differential			
Level		First Difference	
Constant	Constant with trend	constant	Constant with trend
-3.52	-2.91	-8.12	-14.18
Public Spending			
Level		First Difference	
Constant	Constant with trend	constant	Constant with trend
-1.07	-2.84	-5.37	-4.62
Money			
Level		First Difference	
Constant	Constant with trend	constant	Constant with trend
-0.85	-1.98	-4.28	-4.61
Trade Openness			
Level		First Difference	
Constant	Constant with trend	constant	Constant with trend
2.32	-1.02	-7.34	-4.12
Financial Integration			
Level		First Difference	
Constant	Constant with trend	constant	Constant with trend
-0.17	-1.07	-5.14	-7.93
Net Foreign Assets Position			
Level		First Difference	
Constant	Constant with trend	constant	Constant with trend
-2.13	0.62	-5.38	-4.52

Table 2. Cointegration Test Results for 10 Asian Countries following Pedroni (2000)

Panel statistic υ	-1.128
Panel statistic ρ	1.942
Panel statistic t (no parameter)	-2.761
Panel statistic t (parameter)	-1.694
Panel group ρ	1.842
Panel group t (no parameter)	-2.813
Panel group t (parameter)	-1.975

Table 3. Cointegration Vector of 10 Asian Countries following DOLS Method

(lags, leads)	(1, 3)
tt	1.12***
	(0.01)
dprod	-0.37
	(0.16)
ps	0.46***
	(0.02)
mon	-0.12**
	(0.05)
open	-0.16**
	(0.06)
nfa	-0.18*
	(0.10)
R^2	0.78
No. of Obs.	254

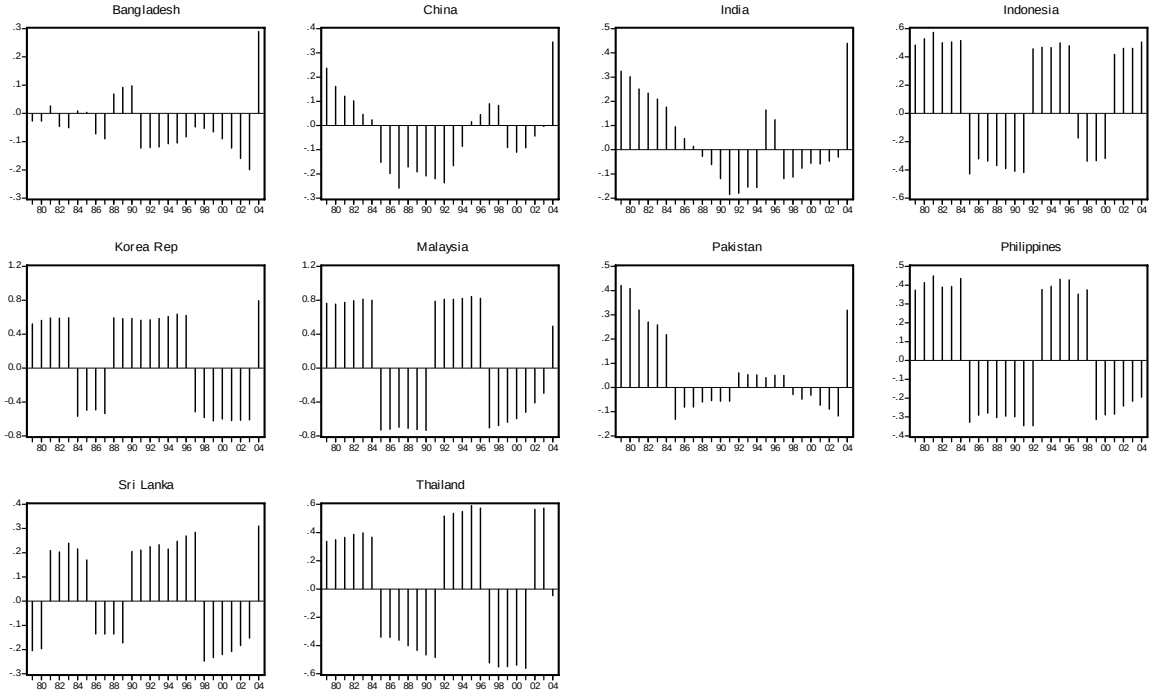
The numbers between parentheses indicate the p-value

Table 4. Basic Regression Model: RER disequilibrium and Economic Growth of 10 Asian Countries Dependant Variable: Growth rate of real GDP per capita.

Estimation Method: GMM in system (Arellano and Bover, 1995)

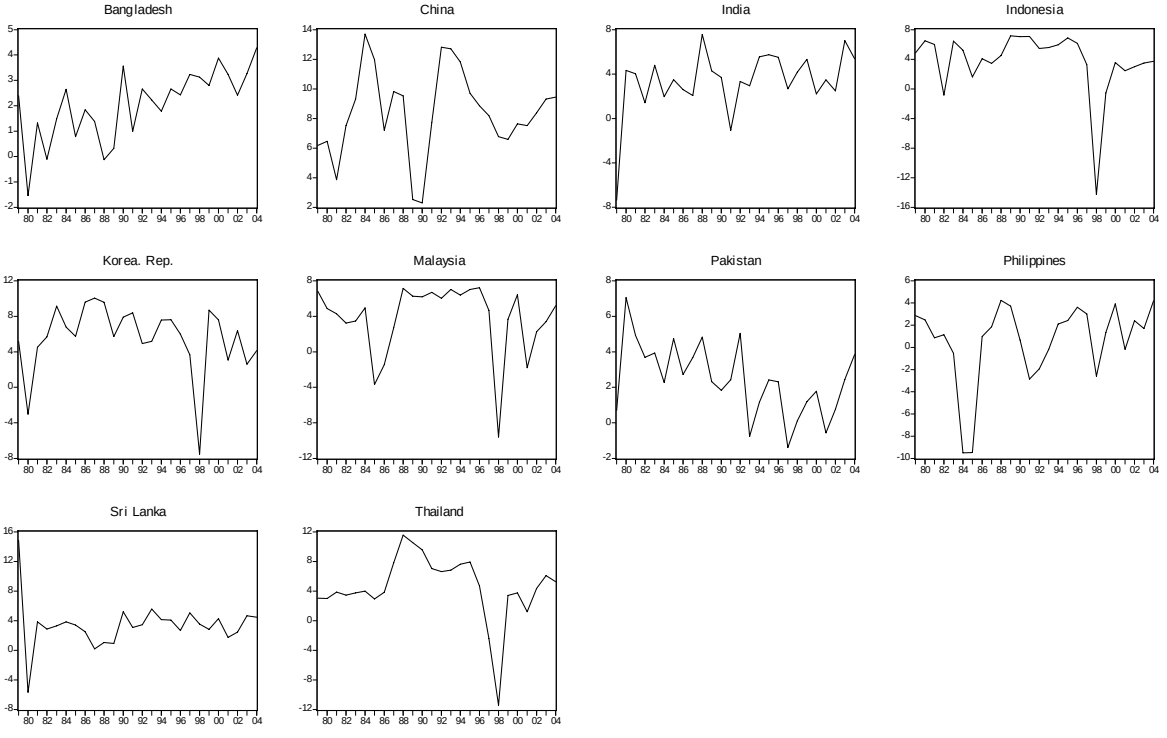
Variables	**[1]**	**[2]**	**[3]**
$\Delta\ Lny_{i,\ t-1}$	0.172*	0.124*	0.104*
	(0.10)	(0.08)	(0.10)
Human Capital	-23.592***	-17.395***	-20.553***
	(0.00)	(0.01)	(0.02)
Export	9.254***	10.147***	9.363***
	(0.02)	(0.02)	(0.01)
Foreign Direct Investment	0.351*	0.417	
	(0.10)	(0.42)	
Financial Development	-1.628		-2.517*
	(0.32)		(0.08)
Spending Dispense	-4.614		
	(0.34)		
Terms of Trade	0.184**	0.156**	0.219**
	(0.05)	(0.04)	(0.05)
Financial Integration	-0.087***	-0.064***	-0.112***
	(0.02)	(0.00)	(0.01)
RER Volatility	-0.371***	-0.328***	-0.173***
	(0.01)	(0.01)	(0.00)
RER Misalignment	-0.539	-0.548	
	(0.62)	(0.47)	
Undervaluation			9.037***
			(0.01)
Overvaluation			-3.824*
			(0.09)
Number of country	10	10	10
Number of Obs.	30	30	30
Tests Specification (p- values)			
- Sargan Test	0.39	0.34	0.29
- Correlation 2nd.	0.76	0.66	0.58

Fig. 1: Evolution of RER Misalignment in SSE Asia (1979-2004)



Sources: WDI (2006). FMI (2006) and calculation of authors

Fig. 2: Evolution of Growth Rate of GDP/capita in SSE Asia (1979-2004)



Sources: WDI (2006) and calculation of authors

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A Realistic Approach to Calculate VaR

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Abstract

Value at Risk (VaR) has become the standard measure of market risk employed by financial industry for both internal and regulatory purposes. VaR is defined as the value that a portfolio will lose with a given probability, over a certain time horizon (usually one or ten days). Despite its conceptual simplicity, its measurement is still a very challenging statistical problem and none of the methodologies developed so far give satisfactory solutions. In this paper, we develop a new approach by expanding the realistic return distribution as linear summation of the standard normal distribution function with its coefficients as Legendre polynomial series to improve the calculation of VaR. One can obtain the distribution function toward the realistic distribution in any assumed precision. This approach outcomes the usual VaR calculation by assuming the normal distributions.

Finally, we test our approach through a real world data. It is found that our approach give more accurate results for the VaR and also more accurate distribution function than the usual normal distributions.

Keywords: VaR, Risk, Distribution, Legendre, Polynomial

1. Introduction

Financial disasters like Enron and Wall Street accounting fraud have emphasized the importance of effective risk management for financial industry. The use of quantitative risk measures has become an essential management tool to be placed in parallel with the models of returns. These measures are used for investment decisions, supervisory decisions, risk capital allocation, external regulation and efficient bankoperations(Markowitz,1952,pp79-91;Eagle,1999,P7341;Beder,,1995,pp12-24;Boudoukh,etal,1998,pp64-67;Foresi, etal,1995,pp1749-1778).

VaR is an estimate of how much a certain portfolio can lose within a given time period and at a given confidence level. Despite its simplicity conceptually, the measurement of VaR is still a very challenging statistical problem and none of the methodologies developed so far gives satisfactory solutions. The major challenge comes from two aspects: first, we need to know the accurate distribution function; second, we need to know how the future distribution will evolve. In this paper, we will focus on this first issue. For the second issue, there are many approaches such as time series, conditional entropy, random matrix (Mehta,1995; Granger,etal,1989,pp87-96; Hong,1999,pp1201-1220; Georges, etal, 2000, pp429-439) to improve the forecast of future distribution functions.

In the literature, VaR calculations usually assuming a simple Normal distribution function to do the calculations. Although it gives estimation on VaR, it is too simple to include more information on the distortion from the normal distribution and will affect the precision of the VaR calculation.

In order to improve the analysis, we propose a Legendre polynomial expansion as follows:

$$f(x) = (a_0 P_0(x) + a_1 P_1(x) + ...)\phi(x) \quad (1)$$

where Ps are Legendre polynomials as in Appendix A. ϕ is the normal distribution. Along this line, there is so-called Gram-Charlier expansion with the coefficients as the Hermite Polynomials (Jarrow,etal,1982,347-369; Jondeau,etal,2001,pp1457-1483; Parton,etal,1952,pp425-427 and Appendix B)which causes negative probability and normalization problem for our data.

By expanding the realistic distribution in a Legendre Polynomials, we expect this approach will give us more accurate results for VaR calculations.

2. Theoretical Model of VaR

2.1 Value at Risk models

The existing models for calculating VaR differ in the methodology they use, the assumptions they make and the way they are implemented. However, all the existing models follow a common general structure, which can be summarized in three points:1) the portfolio is marking-to-market daily; 2)the distribution of the portfolio's returns is estimated; 3)the VaR of the portfolio is computed.

Beder(1995,pp.12-24) applies eight common VaR methodologies to three hypothetical portfolios. The results show the differences among these methods can be very large, with VaR estimates varying by more than 14 times for the same portfolio. Clearly, there is a need for a statistical approach to estimation and model selection.

2.2 Our model

Our model focuses on the improvement of the estimation of the real distribution function from the past return data.

We expand the real distribution function f(x) as the Legendre polynomial as in Eq.1

$$f(x) = (a_0 P_0(x) + a_1 P_1(x) + ...)\phi(x)$$

They are orthogonal with each other in the domain [-1, 1], i.e.:

$$\int_{-1}^{1} P_i(x) P_j(x) dx = \frac{2}{2i+1}\delta_{i,j} \qquad (2)$$

We can scale the Legendre domain into any domain [-A, A]. Considering the decay rate of exponential function of the normal distribution, we calculate the a's as in Eq.(1.4A) in the Appendix A:

$$\int dx f(x)/\phi(x) P_i(x) = a_i N_i = < f(x)/\phi(x), P_i(x) > \qquad (3)$$

With Ni=2/2i+1. In real data analysis, we do it by summation over the data return.

Now, Calculate VaR:

$$G(A) = \int_{A}^{\infty} f(x)dx = F(x)|_{A}^{\infty} \geq \alpha \qquad (4)$$

Here, $F(x)|_{A}^{\infty}$ can be integrated analytically as in the appendix A. Then, we have

$VaR_\alpha = A = G^{-1}(\alpha).$

This is the modified VaR.

In the practical calculation, we compute the VaR through the plot of the curves: $\begin{cases} y = G(x) \\ y = \alpha \end{cases}$,the intersection of these two curves is the modified VaR as shown in Fig.1:

$VaR_\alpha = A = G^{-1}(\alpha).$

Insert Figure 1 Here

3. Real data analysis

As a test of our approach above, we pick the index data from Chinese Shanghai stocks exchange index as the real data. We analyze it as three steps: 1) we first calculate the VaR for usual assumption of normal distribution, 2) then calculate VaR from our modified distribution. Finally, 3) we compare the model results with the direct calculation of VaR from the real data. Furthermore, we plot the distribution function for both normal distribution and modified distributions and compare with the real data distribution.

3.1 The VaR calculations

In order to facilitate the calculation, we take $\alpha = 95\%.$ i.e., the probability of 95% to lose the VaR in a month: N=30 days. For normal distribution, VaR=1.65Nσ .We take $r_t = \ln(I_t / I_{t-1})$ as the t-day's daily return of the index. The period is from 1992-1-2 to 2000-12-29 for 9 years.

For comparison, we calculate the Legendre polynomial results as in Eq.1 to 5th order:

$$f(x) = \phi(x)(-1.551 - 2.980P_1(x) - 1.086P_2(x) + 2.989P_3(x) + 5.974P_4(x) + 4.666P_5(x))$$

We plot the results as the way shown in Fig.1.

Let G(x) = 0.95, we can solve x for VaR. The results are shown in the following table:

Insert Table 1 Here

From table 1, we find that the first order distribution is good enough to catch the real VaR. The normal distribution is much off both in VaR and the distribution as shown in the following. The higher order correction doesn't improve the VaR but really catch the peak shape. So the tail seems not get the weight in the expansion.

3.2 Plots of the distribution functions

As shown in Fig.2, the standard normal distribution seems far off from the real data distribution which got a much sharp peak. The first Legendre correction doesn't change the normal distribution much in the peak but shift the VaR toward the real VaR closer. It should be a successful try toward the real VaR. The second and the third Legendre corrections are closer to the real data distribution in the peak, but the VaR is little off the real VaR. It catches the peak shape but ignores the tail. We also notice that peaks shift little away from the normal peak. Especially, the third Legendre correction shows negative probability in the near-peak region which is a sign the real distribution is far off the normal distribution, and certainly the VaR is far off the real one. The Higher order correction should be careful to use due to the stability of the coefficients calculations. We present the VaRs in the table 1. We conclude that our Legendre expansion is a good attempt to get a better VaR toward the realistic data. But our real data is far off from the normal distribution so that our expansion to the 5^{th} order is not enough.

Insert Figure 2 Here

4. Conclusion

We proposed a new way to calculate VaR. Any real distribution functions are expanded into a combination of the standard normal distributions with its coefficients as the Legendre polynomials. To get more accurate distributions, we need more information from the stock return than just the average return and standard deviation. Unlike most of the models assuming the normal distribution, we think the normal distribution only catches two pieces of information from the stock's returns. We approach real world stock's return's distributions by expanding the real distributions as Legendre polynomials of normal distribution's. We analyze a real stocks data and find that our approach present systematically more accurate distribution and of course more precise VaR as expected.

Appendix

Appendix A: Legendre Polynomial Expansions:

The Legendre polynomial is defined as:

$$\begin{aligned} &P_0 = 1, \\ &P_1 = x, \\ &P_2 = \frac{3x^2 - 1}{2}, \\ &P_3 = (5x^3 - 3x)/2 \\ &P_4 = \frac{35x^4 - 30x^2 + 3}{8}, \\ &\text{.....} \\ &P_i(x) = \frac{(2i-1)P_{i-1}(x) - (i-1)P_{i-2}(x)}{i}, i = 2,3,..... \end{aligned} \tag{1.1A}$$

These bases are orthogonal with each other in the domain [-1, 1], i.e.:

$$\int_{-1}^{1} P_i(x)P_j(x)dx = \frac{2}{2i+1}\delta_{i,j} \tag{1.2A}$$

The amplitude of the LPs are within [-1, 1] for the domain [-1, 1]. Since the Normal distribution are strong localized around 0, so, we can scale the LPs to any region which is suitable to the real data's distribution, such as x=y/L, y belongs to [-L, L]. As long as after L, the real data f(x) equals zero, then we can virtually expand the f(x) in the region $[-\infty, \infty]$, as

$$f(x) = (a_0 P_0(x) + a_1 P_1(x) + ...)\phi(x)$$

The integral can be done analytically as follows:

$$\int_{-\infty}^{\infty} f(x)dx = a_0 + a_1 < x > + a_2(3 < x^2 > -1)/2 + ... \quad (1.3A)$$

where <x> is the average over normal distribution N(0,1). etc. We only need to calculate the normal moments to get the normalization. The coefficients can be calculated from the orthogonalization of P's:

$$\int dx f(x)/\phi(x) P_i(x) = a_i N_i =< f(x)/\phi(x), P_i(x) > \quad (1.4A)$$

with

$$N_i = 2/(2i+1)$$

Appendix B: Hermite Polynomial Expansions

First, to any distribution function, we expand as following:

$$f_X = c_0\varphi(x) + c_1\varphi'(x) + \frac{c_2}{2!}\varphi''(x) + \frac{c_3}{3!}\varphi^{(3)}(x) + \cdots\cdots \quad (1.1B)$$

Where c_i as the expanding coefficients to be determined from the data, $\varphi(x)$ is the standard normal distribution with average 0 and standard deviation 1. $N(0,1)$, i.e., the density function is:

$$\varphi(x) = \frac{1}{\sqrt{2\pi}}\exp(-\frac{x^2}{2}) \quad (1.2B)$$

and $\varphi'(x), \varphi''(x), \varphi^{(3)}(x)$ are $\varphi(x)$'s 1→4th order derivatives.To any $\varphi^{(\upsilon)}(x)$, we have:

$$\varphi^{(\upsilon)}(x) = (-1)^{\upsilon} H_{\upsilon}(x)\varphi(x) \quad (1.3B)$$

where, $H_{\upsilon}(x)$ is Hermite polynomial:

$$H_m(x) = m!\sum_{k=0}^{m/2}\frac{(-1)^k}{2^k k!(m-2k)!}x^{m-2k} \quad (1.4B)$$

Therefore, to any given real stock's distribution, we can find an asymptotic way to approach it as shown above. Once we get the improved distribution function, we calculate the probability as follows in order to figure out VaR:

$$G(A) = \int_A^{\infty} f(x)dx = \int_A^{\infty}[c_0\phi(x) + c_1\phi'(x) + \frac{c_2}{2!}\phi''(x) + ...]dx$$

We get:

$$G(A) = F(A) - \sum c_n \phi^{(n-1)}(A) \quad (1.5B)$$

with

$$F(A) = \int_{A}^{\infty} \phi(x)dx$$

Start from Eq.(1.5B), we obtain:

$$VaR_{\alpha} = A = G^{-1}(\alpha).$$

Equation (1.1B) is the so-called Gram-Charlier expansion.

Now calculate c's:

First we have:

$$< x^{2N+1} >_0 = \int_{-\infty}^{\infty} \phi(x)x^{2N+1}dx = 0;$$

and

$$< x^{2N} >_0 = \int_{-\infty}^{\infty} \phi(x)x^{2N}dx = (2N-1)!!;$$

For c_0:

$$1 = \int_{-\infty}^{\infty} f(x)dx = c_0$$

Where we used:

$$0 = \int_{-\infty}^{\infty} \phi'(x)dx = \int_{-\infty}^{\infty} \phi''(x)dx = ..$$

$$1 = \int_{-\infty}^{\infty} \phi(x)dx$$

Next calculate c_1:

$$\mu = \int_{-\infty}^{\infty} f(x)xdx = -c_1 = \sum_{i=1}^{N} x_i / N$$

Here we used:

$$0 = \int_{-\infty}^{\infty} \phi(x)xdx = \int_{-\infty}^{\infty} \phi''(x)xdx = ...$$

Calculate c_2

$$\int_{-\infty}^{\infty} f(x)x^2dx = c_2 + (2-1)!! = \sigma^2 + \mu^2 = \sum_{i=1}^{N} x_i^2 / N$$

so

$$c_2 = < x^2 > -1$$

Similarly

$$
\begin{aligned}
c_3 &= -\int_{-\infty}^{\infty} f(x)x^3 dx = -\sum_{i=1}^{N} x_i^3 / N; \\
c_4 &= \sum_{i=1}^{N} x_i^4 / N - 3 =< x^4 > -3 - 6c_2; \\
&\cdots\cdots \\
c_n &= (-1)^N \sum_{i=1}^{N} x_i^n / N - \frac{1}{2}(1+(-1)^N)(N-1)!! - \sum_{k=1}^{[N/2]-1} \frac{N!(2k-1)!!}{(N-2k)!2k!} c_{N-2k}
\end{aligned}
\tag{1.6B}
$$

From above computation, we obtain:

$$
\begin{aligned}
c_0 &= 1; \\
c_1 &= -\mu =< x >= \sum x_i / N; \\
c_2 &= \sigma^2 + \mu^2 - 1 = \sum x_i^2 / N - 1; \\
&\cdots\cdots
\end{aligned}
$$

Therefore, the expanded distribution function is as:

$$
f(x) = \phi(x) - \mu\phi'(x) + \frac{\sigma^2 + \mu^2 - 1}{2!}\phi''(x) - \frac{\gamma}{3!}\phi'''(x) + \ldots \tag{1.7B}
$$

where, $\gamma = \sum_{i=1}^{N} x_i^3 / N =< x^3 >$ is the first term including additional information from the data than the normal distribution, which should present the first distorted additional distribution other than the normal distribution.

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Table 1.VaR results from the corrections.

Real data	VAR(Normal Distribution)	VAR(1st correction to order L1)	VAR(2nd correction to L2)	VAR(3rd order to L3)	VAR(4th order to L4)	VAR(5th order to L5)
1.48 σ N	1.65N σ N	1.43N σ N	1.32 σ N	0.56 σ N	1.88 σ N	1.25 σ N

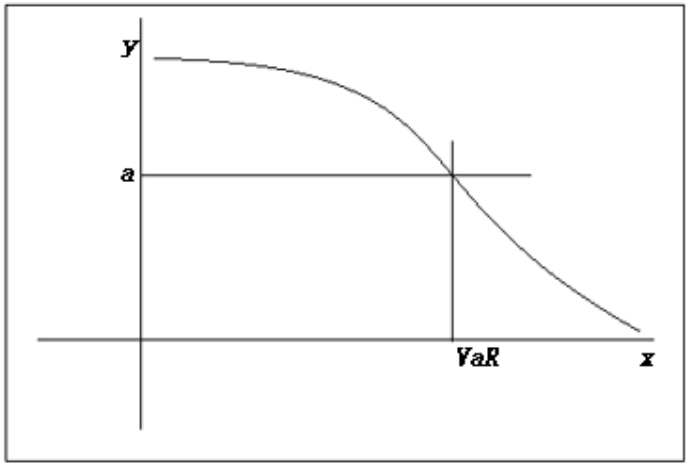

Figure 1. Schematic drawing of obtaining VaR from the modified distribution function.

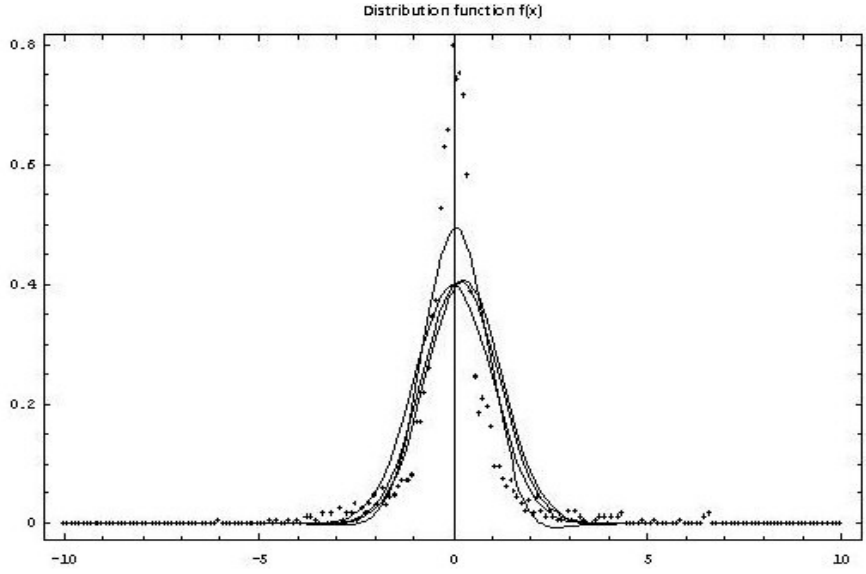

Figure 2. The distribution functions of the models:1) doted curve is the real data distribution;2) lowest curve is normal distribution;3) second lowest is the L1 correction;4) third lowest is the L2 correction;5) top curve is the L5 corrections.

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On the Effect of Subprime Crisis on Value-at-Risk Estimation: GARCH Family Models Approach

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Abstract

A survey of the risk management literature shows that few studies have attempted to take into account financial crisis in market risk measurement, in particular when using a Value-at Risk (VaR) analysis. In this paper, we use models to investigate the effects of subprime crisis on the Value-at-Risk estimation. In this framework, we investigate GARCH family models such as, GARCH, IGARCH, and GJR-GARCH. Each is adjusted based on three residuals distributions; normal, Student and Skewed Student-t. Using American stock market data, we show that dynamic volatility is different between the stability and during crisis periods. The estimation results indicate that the amount of VaR is different during these two time periods. This finding could be explained by the volatility clustering effect. The empirical results show also that GJR-GARCH model performs better in both sub-sample periods, in comparison with GARCH and IGARCH models. Moreover, we conclude that Student-t and Skewed Student-t distributions are preferred in the stable period while the normal distribution is recommended during the turbulent period.

Keywords: Value-at–Risk, Subprime crisis, Risk management, Market risk, Risk measure, GARCH, Volatility asymmetry.

1. Introduction

In the last few years, risk management has known an important advance. In response to the financial crisis of the early 1990's, risk management was started by Value-at-Risk which has become one of the key measures of financial market risk. VaR is defined as an estimate of the maximum potential loss to be expected by a financial institution over a given period with a fixed probability. The Basle Committee prescribes its use as an internal management for financial institutions and risk managers. This technique of risk measurement has known such advances in the field of risk management and being now used to control and manage risk actively. Statistically, VaR, for a given portfolio, is simply an estimate of a specified percentile of the probability distribution of the portfolio's value change over a given holding period. The specified percentile is usually taken in the lower tail of the distribution (for e.g., 95th percentile or the 99th one).

In the literature, several approaches have been used in Value-at-Risk estimation and prediction, such as RiskMetrics model, known as the benchmark approach. Alternatives have been developed and have outperformed the benchmark RiskMetrics model in the VaR prediction. Indeed, Danielson and de Varies (1997), McNeil and Fray (2000) and Ho et al (2000) use extreme value theory to estimate Value-at-Risk. Later, Engle and Manganelli (2004), utilize a quantile regression method. Other approaches, based on Markov switching techniques (Billio and Pelizon, 2000) and high frequency data (Beltratti and Morana, 1999) are also used. In addition, the concept of ''realized volatility'' has emerged as a new technique using the intra-day data as a better alternative to standard VaR model (Andersen, et al, 1999, Moosa and Bollen, 2002)(Note 1).

As far as VaR estimation is concerned, the GARCH family models constitute one of the most interesting framework for VaR prediction which could capture the time-varying volatility feature and provide an efficient variance prediction (Wong and So, 2003; So and Yu, 2006). In the ARCH specification by Engle (1982) and later its generalization (GARCH), by Bollerslev (1986), the residual series was supposed to be normally distributed. However, this assumption was often criticized and comprises at least three drawbacks. First, the normal distribution for asset returns can not describe the extreme events. Second, recent empirical studies find that normal distribution for residual series driven from GARCH type models may generate substantial bias in VaR estimation which mainly concerns the tail properties of this series distribution. Third, return distribution has usually a heavier tail than a normal distribution (Pollitis, 2004). This is mainly due to asymmetry and leptokurtosis of the data distribution. Therefore, several propositions have been made as alternatives to the normal distribution, such as the Student t-distribution (Bollerslev, 1987; Hansen, 1994), generalized error distribution (Nelson, 1991), generalized hyperbolic distribution (Eberlein and Keller, 1995; Barndorff-Nielsen, 1997), stable distribution (McCulloch, 1996), non-central Student t distribution (Harvey and Siddique, 1999), Gram–Charlier distribution (Rockinger and Jondeau, 2001), Pearson's Type IV distribution (Premaratne and Bera, 2001; Yan, 2005; Bhattacharyya et al, 2007), skewed t distribution (Jondeau and Rockinger, 2003), Johnson's SU distribution (Yan, 2005), and mixture of normal distributions (Alexander and Lazar, 2006).

To the best of our knowledge, most empirical studies dealing with VaR calculation have focused on stock market risk (Brooks and Persand, 2002; Giot and Laurent, 2003b, 2004; Huang and Lin, 2004; Chiu et al., 2005). A very few studies have attempted to take into account financial crash and crisis in market risk measurement, especially in VaR context. In this paper, we use GARCH models in order to investigate the effects of subprime crisis, which have affected the American stock markets in July 2007, on VaR estimation. For this purpose, we investigate three GARCH specifications, GARCH, IGARCH and GJR-GARCH models. Each will be adjusted by three residuals distributions; namely normal, Student and Skewed Student distribution.

The remainder of this paper is organized as follows. The VaR concept is described in section 2. Section 3 presents the GARCH family models used for VaR prediction. Section 4 investigates the GARCH family estimation which depends on three residual distributions. Section 5 focuses on model based VaR evaluation techniques. The last section presents the data set, preliminary studies and empirical findings. Finally, we conclude the paper.

2. General concept of long and short position Value-at-Risk

The VaR technique was introduced by JP Morgan in 1990 to measure the risk of declining values of financial assets. As in Giot and Laurent (2003), we focus on modelling VaR for portfolios defined on *long* and *short* trading positions.

2.1 Long trading positions VaR

Following Giot and Laurent(2003), traders or portfolio managers have long trading positions if they bought the traded asset and are concerned when the price of the asset falls. To define the long position VaR, let X_t be the price of a financial asset on day *t*. A *k*-day long position VaR on day *t* is defined as the amount for which the probability, that it exceeds the loss $X_{t-k} - X_t$, is equal to a confidence level $1-\alpha$. This could be formulated as follows:

$$Pr\left(X_{t-k} - X_t \leq VaR_{t,k}\right) = 1 - \alpha. \quad (1)$$

For one-day VaR, this could be rewritten very simply:

$$Pr\left(X_{t-1} - X_t \leq VaR_{t,1}\right) = 1 - \alpha. \quad (2)$$

Financial time series of returns are defined as:

$$r_t = Log\left(X_t\right) - Log\left(X_{t-1}\right). \quad (3)$$

Under the assumption, that asset's scaled returns follow a given distribution noted $\mathbb{D}$ (Note 2), then the long position one-day VaR at level α is given by

$$VaR_{t/1,Long} = \mu + q_{\alpha}^{\mathbb{D}}\sigma_t, \quad (4)$$

where μ is the mean of return series, $q_{\alpha}^{\mathbb{D}}$ denotes the α^{th} percentile according to the statistical distribution $\mathbb{D}$ and σ_t indicates the standard deviation or volatility on day t, which could be obtained via GARCH family models.

2.2 Short trading positions VaR

The short position VaR is defined when traders incur losses when stock prices increase. Giot and Laurent (2003) indicate that in the case of short position VaR, the trader loses money when the price increases because he would have to buy back

the asset at a higher price than the one he got when he sold it. Thus, we consider also a short position in the investment which is defined as follows:

$$Pr(X_t - X_{t-1} \leq VaR_{t,1}) = 1 - \alpha. \quad (5)$$

We obtain:

$$VaR_{t,1,short} = \mu + q^D_{1-\alpha}\sigma_t, \quad (6)$$

Where $q^D_{1-\alpha}$ denotes the $(1-\alpha)^{th}$ percentile according to the statistical distribution D.

From equations (4) and (6), we note that VaR depends on three components: the mean μ, the quantile q^D_α and conditional standard deviation σ_t. In the next sections, we will attempt to model these components. Indeed, for the mean and conditional standard deviation, we use GARCH type models, and for the quantile, we adjust residual series by three distributions such as normal, student t and skewed student t distributions.

3. GARCH family models and volatility dynamics

We consider the return series defined by equation (3). Let the information up to time t be designed *by* Ω_t. The standard GARCH(*p,q*) model developed by Bollerslev (1986) is defined by

$$\begin{aligned} r_t &= \mu + \varepsilon_t, \quad \varepsilon_t \backslash \Omega_{t-1} \sim D(0, \sigma_t^2) \\ \sigma_t^2 &= w + \phi(L)\varepsilon_t^2 + \theta(L)\sigma_t^2, \end{aligned} \quad (7)$$

where $w > 0, \phi(L) = a_1 L + a_2 L^2 + \cdots + a_p L^p$ denotes the lag polynomial with p order according to ARCH part, with $a_i \geq 0, \ i = 1,2,\ldots,p$. $\theta(L) = b_1 L + b_2 L^2 + \cdots + b_q L^q$ is the lag polynomial with q order according to GARCH part, with $b_j \geq 0, \ j = 1,2,\ldots,q$.

L is the lag operator such as $L^i \varepsilon_t^2 = \varepsilon_{t-i}^2, \ i = 1,2,\ldots,p$ and $L^j \sigma_t^2 = \sigma_{t-j}^2, \ j = 1,2,\ldots,q$. D is a conditional density with zero mean and variance σ_t^2 which can be supposed taking many specifications. In this work, we consider three conditional distributions, namely the normal, student t and skewed student t.

3.1 The standard GARCH(1,1) model

Bollerslev et al. (1992) show that GARCH(1,1) specification yields to better results in most applied situations. More recent empirical research illustrates that GARCH (1,1) model could adjust financial asset returns with very successful variance prediction. In this study, we apply the GARCH(1,1) family models and their extensions to estimate the Value-at-Risk. The GARCH(1,1) could be presented as follows:

$$\begin{aligned} r_t &= \mu + \varepsilon_t, \quad \varepsilon_t \backslash \Omega_{t-1} \sim N(0, \sigma_t^2) \\ \sigma_t^2 &= w + a\varepsilon_{t-1}^2 + b\sigma_{t-1}^2, \end{aligned} \quad (8)$$

where w, a and b are non-negative parameters with the restriction of $a + b < 1$ to ensure the positivity of conditional variance σ_t^2 and stationarity as well (Bollerslev,1986).

3.2 The IGARCH(1,1) model

Engle and Bollerslev (1986) introduce the IGARCH (Integrated GARCH model) in order to take into account the existence of a unit root in the variance. Therefore, the IGARCH (1, 1) model is defined as follows:

$$\begin{aligned} r_t &= \mu + \varepsilon_t, \quad \varepsilon_t \backslash \Omega_{t-1} \sim D(0, \sigma_t^2) \\ \sigma_t^2 &= w + (1-a)\sigma_{t-1}^2 + a\varepsilon_{t-1}^2. \end{aligned} \quad (9)$$

This model is a better alternative to GARCH (1, 1) specification. When $\mu = 0$ and $b = \lambda$ (smoothing parameter), the IGARCH (1, 1) model reduces to the so called "RiskMetrics" model of JP Morgan (1996) which is defined by:

$$\begin{aligned} r_t &= \varepsilon_t, \quad \varepsilon_t \backslash \Omega_{t-1} \sim D(0, \sigma_t^2), \\ \sigma_t^2 &= \lambda\sigma_{t-1}^2 + (1-\lambda)\varepsilon_{t-1}^2, \end{aligned} \quad (10)$$

where $0 < \lambda < 1$. To improve the performance of RiskMetrics model, we need to set the smoothing parameter equal to 0.94 for daily data and to 0.97 for monthly data. It was shown that λ = 0.94 produces very good forecasts for 1-day volatility (RiskMetrics, 1996; Fleming et al., 2001).

3.3 The GJR-GARCH model

An alternative approach allows for capturing the effect of asymmetry of the disturbances on the conditional variance based on GJR-GARCH model. This model was introduced by Glosten, Jagannathan and Runkle (1993). This specification is equivalent to the GARCH one, with the only difference being the incorporation of a dummy variable multiplied by the squared of residual terms in the variance equation. Formally, the GJR-GARCH (1.1) model is given by:

$$\begin{aligned} r_t &= \mu + \varepsilon_t, \quad \varepsilon_t \backslash \Omega_{t-1} \sim D(0, \sigma_t^2) \\ \sigma_t^2 &= w + \alpha \varepsilon_{t-1}^2 + \varphi I_{\varepsilon_{t-1}<0} \varepsilon_{t-1}^2 + b\sigma_{t-1}^2, \end{aligned} \tag{11}$$

where $I_{\varepsilon<0} = \begin{cases} 1 & if \quad \varepsilon_t < 0 \\ 0 & if \quad \varepsilon_t \geq 0 \end{cases}$ and $\alpha + b + 0.5\varphi < 1$.

The GJR-GARCH is a model with threshold where the dummy variable is equal to 1 if the residual of the previous period is negative and equal to zero otherwise. Thus, the conditional variance follows two different processes according to the sign of the error terms.

4. Modeling residual series and GARCH family models estimation

Various probability distributions could be used in the framework of the MLE procedures to estimate the parameters of GARCH family models. In this paper, we investigate the normal, the Student t and the skewed t distributions.

4.1 The normal distribution

The use of normal density offers the advantage of simplicity. Recent studies recognize that the properties of the normal distribution are not compatible with the stylized facts (leptokurtic and asymmetrical conditional distribution) generally observed in financial asset return series.

For instance, under normality hypothesis, the residual terms is normally distributed, and we write:

$$f(\varepsilon_t) = \frac{1}{\sigma_t \sqrt{2\pi}} \exp\left(-\frac{1}{2\sigma_t^2}\varepsilon_t^2\right). \tag{12}$$

Under this hypothesis, the Log-likelihood function for $GARCH$ family models is defined by

$$L(r_t \backslash \theta) = \sum_{t=1}^{T} -\frac{1}{2}\left[\ln(2\pi) + \ln(\sigma_t^2) + \varepsilon_t^2\right], \tag{13}$$

Where θ and σ_t^2 are respectively the parameters vector and conditional variance corresponding to each GARCH specification, developed previously, and $z_t = \frac{\varepsilon_t}{\sigma_t} \sim N(0,1)$.

Under the normality hypothesis, the one-day VaR, for each GARCH specification is obtained by replacing the percentile q_α^D, in equation (4), by the α^{th}one relevant to the standard normal distribution $Norm_\alpha$. Then, the long and short position VaR under the normality hypothesis are given by:

$$\begin{aligned} VaR_{1,\alpha,long} &= \beta + \hat{\sigma}_t Norm_\alpha, \\ VaR_{1,\alpha,short} &= \beta + \hat{\sigma}_t Norm_{1-\alpha}, \end{aligned} \tag{14}$$

with σ_t is specific to each $GARCH$ model described previously and $Norm_\alpha$ and $Norm_{1-\alpha}$denote respectively the α^{th} and $(1-\alpha)^{th}$ percentile according to the standard normal distribution. We note that the normality hypothesis could lead to convergent estimates of the parameters of GARCH model (principle of the pseudo-maximum likelihood). Nevertheless, the specification of the conditional distribution does not only relate to the problem of parameters estimation of GARCH models, but also and in more direct way to the determination of the fractile of the conditional distribution. The choice of a normal specification may have significant effect on the VaR estimates and forecasts.

4.2 The Student distribution

The Student distribution offers the possibility of modeling tails of distribution thicker than those of the normal one (leptokurtic distribution). More precisely, the Kurtosis of the Student distribution is determined by its degree of freedom η. Consequently, within the GARCH framework, this estimated parameter allows to capture the excess of Kurtosis which could not be explained even by GARCH model itself. Under this hypothesis, the standardized residual series z_t follows the standard Student t distribution defined by

$$g(z_t, \eta) = \frac{\Gamma\left(\frac{\eta+1}{2}\right)}{\sqrt{\pi\eta}\,\Gamma\left(\frac{\eta}{2}\right)}\left(1+\frac{z_t^2}{\eta}\right)^{-\frac{\eta+1}{2}} \quad (15)$$

With $\Gamma(k) = \int_0^{+\infty} e^{-x}x^{k-1}dx$ and $z_t = \frac{\varepsilon_t}{\sigma_t} \sim N(0,1)$. In this case, the Log-likelihood function for GARCH family models is defined by:

$$L(\eta_t \backslash \theta) = \sum_{t=1}^{T} \ln\left(\frac{\Gamma\left(\frac{\eta+1}{2}\right)}{\sqrt{\pi(\eta-2)}\,\Gamma\left(\frac{\eta}{2}\right)}\right) - \frac{1}{2}\ln(\sigma_t^2) - \frac{\eta+1}{2}\ln\left(1+\frac{\varepsilon_t^2}{\eta-2}\right), \quad (16)$$

where θ and σ_t^2 are respectively the parameters vector and conditional variance corresponding to each GARCH specification developed previously.

The standardized Student distribution is symmetric and the skewness is null if $\eta > 3$. Moreover, this distribution is leptokurtic if $\eta > 4$. Under the hypothesis that the residual series follows the Student distribution , the one-day VaR, for each GARCH specification is obtained by replacing the percentile q_α^p, in equation (4), by the α^{th}one relevant to the standard Student t distribution Stu_α. Then, we obtain

$$\begin{aligned} VaR_{t,\alpha,Long} &= \beta + \hat{\sigma}_t Stu_\alpha \\ VaR_{t,\alpha,Short} &= \beta + \hat{\sigma}_t Stu_{1-\alpha} \end{aligned} \quad (17)$$

with σ_t is the conditional standard deviation relevant to each GARCH specification described previously and Stu_α and $Stu_{1-\alpha}$ denote respectively the α^{th} and $(1-\alpha)^{th}$percentile of a Student distribution with η degree of freedom.

4.3 The skewed Student t distribution

Fernandez and Steel (1998) attempt to extend the Student-t distribution by adding a skewness parameter (Note 3) in order to accommodate the excess of skewness and kurtosis. They allow the introduction of skewness in continuous unimodal and symmetric distribution $g(.)$ by changing the scale at each side of the mode. The main drawback of this density is that it is expressed in terms of the mode and the dispersion. Lambert and Laurent (2001) re-expressed the skewed student-t density in such a way that the innovation process has zero mean and unit variance. The conditional mean equation could be written as follows: $r_t = \mu_t + \varepsilon_t$ with $\mu_t = \mu$.

where $\varepsilon_t = \sigma_t z_t$ follows the GARCH(1, 1), IGARCH(1,1) and GJR-GARCH(1,1) processes. It is widely observed that the distribution of residuals tends to appear asymmetric and leptokurtic. To capture excess kurtosis and skewness, we use the skewed Student-t distribution of Lambert and Laurent (2001).

Following the work of Giot and Laurent (2003) (Note 4), we use a standardized version of the skewed Student-t distribution introduced by Fernandez and Steel (1998). According to Lambert and Laurent (2001), and provided that $v > 2$, the innovation process z_t is said to be (standardized) skewed Student-t distributed, i.e. $z_t \sim SKST(0,1,\xi,v)$, if:

$$f(z_t/\xi, v) = \begin{cases} \frac{2}{\xi+1/\xi}\, g(\xi(sz_t+m)/v) & if\ z_t < -\frac{m}{s} \\ \frac{2}{\xi+1/\xi}\, g((sz_t+m)/\xi/v) & if\ z_t \geq -\frac{m}{s}, \end{cases} \quad (18)$$

where $g(./v)$ is the symmetric (unit variance) Student-t density (Note 5) and ξ is the asymmetry parameter (Note 6). The parameters m and s^2 are respectively the mean and the variance of the non-standardized skewed student-t distribution:

$$m = m(\xi, v) = \frac{\Gamma\left(\frac{v-1}{2}\right)\sqrt{v-2}}{\sqrt{\pi}\,\Gamma\left(\frac{v}{2}\right)}\left(\xi - \frac{1}{\xi}\right) \quad (19)$$

and $$s^2 = \left(\xi^2 + \frac{1}{\xi^2} - 1\right) - m^2 \quad (20)$$

$$s = \sqrt{s^2(\xi, v)}.$$

The sign of $\ln(\xi)$ indicates the direction of skewness, and represents the degree of asymmetry of residual distribution. Hence, if $\ln(\xi) > 0$ ($\ln(\xi) < 0$), the skewness is positive (negative) and the probability density function is skewed to the right (left). When $\xi = 1$, the skewed Student-t distribution is equal to the standard student-t distribution.

The functions $skst_{\alpha}(v, \xi)$ and $skst_{1-\alpha}(v, \xi)$ are respectively the left and the right quantile at $\alpha\%$ for the skewed Student-t distribution with v degrees of freedom and asymmetry coefficient ξ. The log-likelihood function of a standardized (zero mean and unit variance) skewed Student-t distribution is given by:

$$L_{Skst} = T\left\{\ln\Gamma\left(\left(\frac{v+1}{2}\right)\right) - \ln\Gamma\left(\frac{v}{2}\right) - \frac{1}{2}\ln[\pi(v-2)] + \ln\left(\frac{2}{\xi + \frac{1}{\xi}}\right) + \ln(s)\right\} - \frac{1}{2}\sum_{t=1}^{T}\left\{\ln(\sigma_t^2) + (1+v)\ln\left[1 + \frac{(sz_t + m)^2}{v-2}\xi^{-2I_t}\right]\right\}, \quad (21)$$

where $$I_t = \begin{cases} 1 & if \ z_t \geq -m/s \\ -1 & if \ z_t < -\frac{m}{s} \end{cases} \quad (22)$$

with ξ is the asymmetry parameter, v is the degree of freedom of the distribution and $h_t = \sigma_t^2$ satisfies the equations of the GARCH volatility models considered in our study.

The one-step-ahead forecast of the conditional mean $\hat{\mu}_t$ and conditional variance $\hat{\sigma}_t^2$ is computed based on past information. Hence, the one-day-ahead VaR computed at time $(t-1)$, under the skewed Student-t distribution, for long and short trading positions are:

$$\begin{cases} \widehat{VaR}_{t,long} = \hat{\mu} + skst_{\alpha}(v, \xi)\hat{\sigma}_t \\ \widehat{VaR}_{t,short} = \hat{\mu} + skst_{1-\alpha}(v, \xi)\hat{\sigma}_t \end{cases} \quad (23)$$

Lambert and Laurent (2001) show that the quantile function $skst_{\alpha}(v, \xi)$ of a non standardized skewed student density is:

$$skst_{\alpha}(v, \xi) = \begin{cases} \frac{1}{\xi} st_{\alpha, v}\left(\frac{\alpha}{2}(1+\xi^2); v\right) & if \ \alpha < \frac{1}{1+\xi^2} \\ -\xi \, st_{\alpha, v}\left(\frac{1-\alpha}{2}(1+\xi^{-2}); v\right) & if \ \alpha \geq \frac{1}{1+\xi^2} \end{cases}, \quad (24)$$

where $st_{\alpha, v}$ is the quantile function of the (unit variance) Student-t density. We simply obtain the quantile function of the standardized Skewed student-t:

$$skst_{\alpha}(v, \xi)^* = \frac{skst_{\alpha}(v, \xi) - m}{s}, \quad (25)$$

The value of parameter v measures the degree of fat tails in the VaR density. If $v > 2$, the density has fat tails. The value of ξ determines the degree of asymmetry in the VaR density. If $\xi < 1$ ($\ln(\xi) < 0$), $|skst_{\alpha, v, \xi}| > |skst_{1-\alpha, v, \xi}|$ and we will get a bigger VaR for long position than short position, i.e. the VaR for long trading positions will be larger for the same conditional variance than will the VaR for short trading positions. When $\xi > 1$, ($\ln(\xi) > 0$), $|skst_{\alpha, v, \xi}| < |skst_{1-\alpha, v, \xi}|$ and we will get the reverse result.

5. Evaluation methods of model-based VaR

There are several methods for determining accuracy and efficiency of model-based VaR measurement. These methods are based on risk management loss functions such as the binary and quadratic loss functions (Lopez, 1999), on LR test

of unconditional and conditional coverage (Kupiec, 1995; Christoffersen, 1998) (Note 7) and on Mean relative scaled bias (MRSB) proposed by Hendricks (1996). In this paper, we use two approaches to evaluate model's capacity and accuracy in Value-at-Risk estimation, namely the *Sample coverage* used by So and Yu (2006) and LR test of Kupiec (1995).

5.1 Sample coverage approach

The sample coverage is used in the literature to evaluate Value-at-Risk estimation. This approach is based on the computation of the empirical failure rate which is defined by $\hat{\alpha} = k/T$, where T is the total number of observations, $k = \sum_{t=1}^{T} I_t$ denotes the number of exceptions; i.e. the number of times returns exceed (in absolute value) the forecasted VaR in the sample, and I_t is a Bernoulli random variable defined by

$$I_t = \begin{cases} 1 & \text{if } r_t < VaR_t \\ 0 & \text{if } r_t \geq VaR_t \end{cases}, \qquad (26)$$

In a risk management context, I_t represents the *binary loss function*. If the predicted VaR estimate is unable to cover the realized loss, this is called an *exception*. Equal weight is accorded to each loss that exceeds the VaR estimate; and all other profits and losses have a zero weight. We expect that $\hat{\alpha}$ is close to α for a good VaR estimation method. Therefore, the smaller the discrepancy between $\hat{\alpha}$ and α, the better performance is the estimation method. To assess the overall performance of each model, we rank the methods according to $|\alpha - \hat{\alpha}|$ for each case.

5.2 Kupiec test for unconditional coverage

The Kupiec test is the second method used to test the accuracy of the computed VaR values. A likelihood-ratio test is proposed by Kupiec (1995) in order to test if the sample point estimate is statistically consistent with the VaR model's prescribed confidence level. Statistically, testing the accuracy of the model is equivalent to testing the hypothesis $H_0: \alpha = \hat{\alpha}$ versus $H_1: \alpha \neq \hat{\alpha}$. Under the null hypothesis, the likelihood-ratio statistic, denoted by LR_{uc}, follows the chi-square distribution with one degree of freedom. That is:

$$LR_{uc} = -2Log\left[\frac{\alpha^k(1-\alpha)^{T-k}}{\hat{\alpha}^k(1-\hat{\alpha})^{T-k}}\right] \sim \chi^2(1) \qquad (27)$$

6. Empirical analysis

6.1 Data description and preliminary analysis

In this paper, we consider daily NASDAQ stock market index data. The choice of this index is attributable to the subprime crisis that has started in the US since 2007. The return series cover the period going from 01/01/2003 to 10/07/2008. In order to investigate the effect of this crisis on the VaR estimation, we break up our sample into two periods: the first covers the *stability period* (calm period) with a number of 1140 observations (from 01/01/2003 to 16/07/2007) and the second period covers the crisis period having 247 observations (from 17/07/2007 to 10/07/2008). We introduce and characterize our dataset at this stage to set the statistical properties of the series during the two periods. More specifically, we consider return series r_t of closing prices expressed in (3) (Note 8). Table 1provides the descriptive characteristics for the return series, while descriptive graphs (price, daily returns) are included in Figure 1.

Summary statistics clearly indicate that the index is more risky and less profitable in the crisis period than in the normal (stable) one. Indeed, means values are positive in the stability period and negative in crisis one, and standard deviations are higher for this turbulent period. During this period, the return series are extremely volatile which lead to a succession of extremely large positive and negative returns within a very short time span.

The application of some unit root tests indicates that the series are stationary for the two sub-samples series. In addition, it is clear that the normality hypothesis is rejected for the first sub-sample, and accepted for the second one (crisis period). Indeed, we notice that in the stability period, skewness is significantly negative. Moreover, excess kurtosis is significantly different from zero. This situation indicates that the empirical distribution of returns displays fatter tails than the Gaussian distribution in this period. That is, large changes are more often to occur than a normal distribution would imply. For the crisis period, the skewness, kurtosis and Jarque-Berra statistics indicate that the normality hypothesis could not be rejected.

6.2 GARCH family models fitting

In our empirical study, we use first the maximum likelihood method to give parameters estimates for each model defined presciently (Note 9). These estimates could be used to assess the in-sample performance of various GARCH

models in forecasting VaR for long and short positions. In this subsection, we estimate three GARCH family models (GARCH(1,1), IGARCH(1,1) and GJR-GARCH(1,1)) under the normal, Student-t, and skewed Student-t distributions innovations return series. Table 2 compares the estimation results of these models estimations. According to this table, we verify that stationarity condition is obtained, i.e. $a + b < 1$, and $(a + b)$ is close to unity for all GARCH specifications during the two periods. In addition, estimated parameters a and b are all positive and significantly different from zero almost in all considered $GARCH$ specifications. We find that $(a + b)$ increases when a student error model is fitted instead of normal error. In the case of Student error fitting, we observe that the coefficient η is statistically significant at 5% confidence level for the first sub-sample. Consequently, this result indicates that NASDAQ return series is fat tailed and exhibits a leptokurtic characteristic especially in the first period, due to the rejection of the normality hypothesis for return series. However, we observe a large degree of freedom which isn't statistically significant when the data cover the crisis period. This is explained by the presence of normality detected in this period.

For the skewed student-t distribution, the asymmetric parameters are negative and statistically significant in the stability period confirming the fact that the density distribution of NASDAQ return series is skewed to the left side. However, the asymmetric parameters are also negative in the crisis period but insignificantly different from zero. Besides, the empirical results showed that fat-tail phenomenon is strong in the calm period than in the crisis one because the student parameters are significantly different from zero under the three models. As a result, we may conclude that the skewed-student-t-GARCH family models considered outperformed the other models with the normal and student-t distributions innovations in capturing the asymmetry and fat tails of the NASDAQ return distribution.

In order to compare the quality of fitness among the three $GARCH$ specifications, we report the ranking of these models based on AIC (Akaike's information criterion), SH (Schwartz), and HQ (Hannan-Quinn) information criterions (Table 3). According to these criterions, we rank the best models. We use the mean ranks to indicate the average rank for each specification. The model selection procedure is based on two steps. First, we choose the best innovation distribution for each model and we select the best one based on the mean ranks. Then, we choose the best GARCH specification for the three best distributions. Generally, student-t error models perform better than the normal and Skewed Student-t error models in the stability period. However, in the crisis period, results show the superiority of the normal distribution (table 3). From the empirical analysis of these models, the GJR-GARCH model performs the best in the two periods. Thus, we select this model in order to compute in-sample VaR estimations during these two periods. This result could be explained by the asymmetry in volatility which could be detected by the GJR-GARCH specification in the two considered periods.

By taking into account for the volatility asymmetry, we notice that the parameter describing the asymmetric feature in the volatility is positive and statistically significant in the two considered periods. This evidence indicates that unexpected negative returns resulted in more volatility than unexpected positive returns of the same magnitude. In addition, it is clear that volatility clustering is observed in the daily returns graphic, especially in crisis period (graph 1). The GARCH coefficient is statistically significant for all models considered and is found to be around 0.87, 0.9 and 0.8 for GARCH, IGARCH and GJR-GARCH models respectively, under the three distributions for our daily financial time series relative to turbulent period. Given the values of this coefficient, it is obvious that large values of σ_{t-1}^2 will be followed by large values of σ_t^2, and small values of σ_{t-1}^2 will be followed by small values of σ_t^2.

6.3 Assessing the VaR model performance

In order, to assess the performance of based Value-at-Risk model (GJR-GARCH), we present a range of summary statistics that address a number of these different aspects of VaR models to risk managers. Two types of performance criterion are employed: *sample coverage* and *Kupiec LR test for unconditional coverage*.

By adopting VaR as a quantitative measurement of downside risk, risk managers desire to achieve a failure rate equal to the fixed level confidence α.

6.3.1 VaR model performance in stability period

During the first period (stability period), the VaR results computed by the normal, Student-t, and skewed Student-t via the best GJR-GARCH(1,1) model for the long and short trading positions are given in Table 4. The first remark is that the LR Kupiec test accepts the null hypothesis for all confidence levels, for the three distributions in long and short position VaR (except of the 0.5% confidence level). Then, the failure rate is significantly equal to the prescribed confidence levels. This result clearly indicates that the GJR-GARCH(1,1) is very successful in VaR estimation for our data set.

If comparing between distributions, we observe that these later perform better at low confidence levels. Indeed each innovation distribution has the lowest value of sample coverage in the 0.25% confidence level for long and short trading positions. On other hands, the comparison between the three distributions shows that Student-t and skewed Student-t perform better than the normal distribution according to the lowest value of sample coverage (0.0747% versus 1.006%).

6.3.2 VaR model performance in crisis period

As mentioned in Table 5, we obtain the same conclusion for the Kupiec's LR test. Indeed, the null hypothesis is rejected only for 0.5% confidence level and for long trading position. In addition, some values of LR test are not available, due to the absence of exceptions especially for skewed Student-t distribution for long position VaR. Moreover, we note that the Kupiec's LR test accept its null hypothesis for all confidence levels under the three distributions. This result shows that the selected GJR-GARCH model is also successful in VaR calculation in the crisis period. It is clear that the normal distribution performs better in this period. This result could be explained by the return series normality in the turbulent period (Table1).

6.4 Effects of subprime crisis on value at Risk estimation

To investigate the effects of subprime crisis on the VaR's amounts computed by the selected GJR- GARCH(1,1) model, we analyze the descriptive statistics of VaR values in the two sub-periods considered. According to tables 6 and 7, we deduce that the means and standard deviations VaR values, in crisis period, are larger, in absolute value, than those in stable period for the case of long and short trading positions. These findings could be explained by the speculative behavior of investors in the US stock market and in particular to moves of taking buy and sell positions in order to realize short term gains. These speculative actions may lead to generalized increases in almost of all the of financial assets prices to levels that do not reflect market reality but rather to the formation of a speculative bubble. These bubbles lead to a situation where asset prices are significantly different from their fundamental values.

The subprime crisis has led to the deterioration of the American mortgage market. It has been initiated due mainly to an excess liquidity and quickly degenerated into a credit crisis followed by stock market crisis. The stock market prices have rapidly and greatly decreased while the trade volumes ought to increase. Consequently, the volatility of Nasdaq100 index return series, induced by the stock market speculation, has increased during the subprime crisis generating the rise in VaR values.

Finally, we conclude that the subprime crisis has significant effects on Value-at-Risk estimates as it pushes up the amount of maximum losses supported by speculative investors.

7. Conclusion

GARCH type models are widely used to model financial market volatilities in risk management applications. They may be used to model risk attributes such as volatility clustering and the long-range dependence structure that exists in financial indices. In this research work, the GARCH$(1,1)$, IGARCH$(1,1)$, and GJR-GARCH$(1,1)$ models with the normal, Student-t and skewed Student-t error distributions are investigated to estimate one-day-ahead VaR for daily NASDAQ index returns. We focus on the investigation of the effects of American subprime crisis on Value-at-Risk estimation using some GARCH family models listed above. Also, we have assessed the performance of VaR models using the sample coverage and Kupiec LR test for unconditional coverage. The first empirical result confirms that the GJR-GARCH(1,1) specification is chosen in terms of information criterion in the two considered periods. This choice led us to a very successful one-day-ahead VaR calculation. Indeed, the LR Kupiec test shows that this model accept the null hypothesis of equality between the failure rate and the specified VaR confidence levels for in the case of long and short trading positions. If we choose between distributions innovations, we conclude that Student and Skewed Student are preferred in the calm period and that the normal distribution performs the best for the turbulent period due to the observed normality in the return series. Finally, we conclude that the subprime crisis has significant effects on Value-at-Risk estimates as it pushes up the amount of maximum losses supported by speculative investors.

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Notes

Note 1. For comprehensive overview of VaR, See Duffie and Pan (1997), Jorion (2001).

Note 2. In this study, we will consider normal, Student and skewed Student-t distribution for index return series.

Note 3. Hansen (1994) and Paolella (1997) have proposed other asymmetric Student-t densities.

Note 4. AR-APARCH model with a skewed Student density forecasts correctly (both in- and out-of-sample) the 1-day-ahead VaR for three international stock indexes and three US stocks of the Dow Jones index (Giot and Laurent, 2003).

Note 5. The density $f(z_t/1/\xi, v)$ is the symmetric of $f(z_t/\xi, v)$ with respect to the mean, hence $\ln(\xi)$ is better solution to indicate sign of the skewness.

Note 6. The asymmetry coefficient $\xi > 0$ is defined such that the ratio of probability masses above and below the mean is $\frac{P(z \geq 0/\xi)}{P(z < 0/\xi)} = \xi^2$

Note 7. For details see Hung et al(2007).

Note 8. We chose to multiply return series by 100 to express the returns on percentage

Note 9. We use the G@RCH 2.3 Ox package for the model estimation.

Table 1. Summary statistics on daily returns during two periods

	Stability period	Crisis period
Summary statistics		
Obs	1139	247
Min	-4.301	-4.496
Max	5.925	4.284
Mean	0.059	-0.047
St Dev	1.155	1.574
Unit root tests		
ADF	-35.308	-17.834
P-P	-35.399	-18.009
KPSS	0.094	0.113
Z-A	-13.561	-8.629
Normality		
Skewness	0.039	-0.009
(p-value)	(0.594)	(0.949)
Excess Kurtosis	1.34	0.048
(p-value)	(0.000)	(0.879)
JB stat	85.551	0.028
(p-value)	(0.000)	(0.986)

Note: this table reports summary statistics on daily stock market returns before and on crisis period. ADF, P-P, KPSS and Z-A denote the augmented Dickey Fuller, Phillips-Perron, Kwiatkowski-Phillips-Schmidt-Shin and Zivot and Andrews unit root tests respectively

Table 2. GARCH family parameter estimation in the two period

Period	Stability period			Crisis period		
Distribution	Normal	Student	Skewed t	Normal	Student	Skewed t
GARCH model						
μ	0.0565	0.0632*	0.0493*	0.0176	0.0216	0.0140
	(1.838)	(2.080)	(2.440)	(0.204)	(0.251)	(0.164)
w	0.0062	0.0043	0.0075*	0.1161	0.1181	0.0807*
	(1.413)	(1.029)	(1.729)	(1.182)	(1.192)	(2.270)
a	0.0249*	0.0235*	0.0471*	0.0752*	0.0758*	0.0807*
	(3.154)	(2.789)	(3.726)	2.084	2.060	(2.270)
b	0.9691*	0.9722*	0.9392*	0.8796*	0.8782*	0.8825*
	(97.58)	(96.18)	(55.27)	(15.95)	(15.84)	(17.39)
Student DF, η	---	13.763*	---	---	59.022	---
		(2.817)			NaN	
Assymetry, $\ln(\xi)$	---	---	10.854*	---	---	53.909
			(3.433)			(0.393)
Tail, υ	---	---	-0.0761*	---	---	-0.1241
			(-2.007)			(-1.485)
IGARCH model						
μ	0.0556	0.0636*	0.0471*	0.0154	0.0210	0.0085
	(1.807)	(2.091)	(2.319)	(0.179)	(0.255)	(0.101)
w	0.0007	0.0003	0.0020	0.0302	0.0317	0.0288
	(0.484)	(0.238)	(1.263)	(1.231)	(1.300)	(1.247)
a	0.0266*	0.0248*	0.0503*	0.0909*	0.0932*	0.0927*
	(3.338)	(2.948)	(3.793)	(2.239)	(2.328)	(2.461)
Student DF, η	---	12.539*		---	53.843	---
		(2.995)			NaN	
Assymetry, $\ln(\xi)$	---	---	9.176*	---	---	57.948
			(3.904)			NaN
Tail, υ	---	---	-0.0814*	---	---	-0.1401
			(-2.106)			(-1.658)
GJR –GARCH model						
μ	0.0439	0.0531	0.0284	-0.0227	-0.0172	-0.0552
	(1.408)	(1.738)	(1.407)	(-0.266)	(-0.197)	(-0.629)
w	0.0047	0.002	0.0053	0.1917	0.1939	0.2763*
	(1.239)	(0.609)	(1.444)	(1.544)	(1.609)	(2.370)
a	0.0085	0.0036	-0.0115	-0.0465	-0.0516	-0.1074
	(1.014)	(0.424)	(-1.114)	(-0.967)	(-1.006)	(-1.820)
b	0.9701*	0.9743*	0.9547*	0.8473*	0.8464*	0.7968*
	(112.7)	(117.3)	(53.52)	(12.69)	(13.04)	(12.35)
φ	0.0314*	0.0386*	0.0949*	0.244	0.2546	0.4523
	(2.093)	(2.379)	(3.761)	(1.905)	(1.898)	(1.923)
Student DF, η		13.145*	---	---	38.604	---
		(2.995)			(0.317)	
Assymetry, $\ln(\xi)$		---	-0.1008*	---	---	-0.1955
			(-2.616)			(-1.840)
Tail, υ		---	12.971*	---	---	14.808
			(2.970)			(0.983)

Notes: The numbers in the parentheses represent the t-Student statistic of corresponding tests significance. The log-likelihood is the maximized value of the log likelihood function. (*) indicates that the parameter is statiscally significant at 5% level.

Table 3. Model selection based on the information criteria and ranking

	Stabilty period				Crisis period			
	AIC	SC	HQ	*Mean rank*	AIC	SC	HQ	*Mean rank*
GARCH-Normal	3.0328 (3)	3.0505 (2)	3.0395 (3)	*2.66*	3.6676 (1)	3.7201 (1)	3.6887 (1)	***1 (3)***
GARCH- Student	3.0245 (2)	3.0466 (1)	3.0328 (1)	***1.33 (3)***	3.6746 (3)	3.7401 (2)	3.7009 (2)	*2.33*
GARCH-Skewed	3.0243 (1)	3.0509 (3)	3.0343 (2)	*2*	3.6738 (2)	3.7526 (3)	3.7054 (3)	*2.66*
IGARCH- Normal	3.0341 (3)	3.0474 (3)	3.0391 (3)	*3*	3.6669 (1)	3.7063 (1)	3.6827 (1)	***1 (2)***
IGARCH- Student	3.0242 (2)	3.0419 (1)	3.0309 (1)	***1.33 (2)***	3.6739 (3)	3.7264 (2)	3.6949 (2)	*2.33*
IGARCH- Skewed	3.0239 (1)	3.0460 (2)	3.0323 (2)	*1.66*	3.6714 (2)	3.7370 (3)	3.6977 (3)	*2.66*
GJR- Normal	3.0304 (3)	3.0525 (3)	3.0387 (3)	*3*	3.6419 (1)	3.7075 (1)	3.6683 (1)	***1 (1)***
GJR- Student	3.0206 (2)	3.0471 (1)	3.0306 (1)	***1.33 (1)***	3.6486 (3)	3.7273 (2)	3.6802 (3)	*2.66*
GJR-Skewed	3.0192 (1)	3.0501 (2)	3.0309 (2)	1.66	3.6428 (2)	3.7346 (3)	3.6796 (2)	*2.33*

Table 4. Long and Short position VaR calculated by GJR-GARCH(1,1) before crisis period

	Long position VaR			Short position VaR	
Quantile	Sample coverage	LR statistic	Quantile	Sample coverage	LR statistic
Normal distribution					
5%	0.5215%	0.6328	*95%*	0.0833%	0.0166
2.50%	0.3922%	0.686	*97.50%*	0.5675%	1.4075
1%	0.1394%	0.2142	*99%*	0.3146%	1.0382
0.50%	4.2989%	68.8550*	*99.50%*	0.1494%	0.5722
0.25%	**0.1006%**	0.4109	*99.75%*	**0.0747%**	0.2854
Student distribution					
5%	0.5302%	0.6993	*95%*	1.0561%	2.8796
2.50%	0.5719%	1.6597	*97.50%*	0.8348%	3.6903
1%	0.3865%	1.9971	*99%*	0.7371%	8.8672*
0.50%	4.7371%	93.0795*	*99.50%*	0.4124%	5.9468
0.25%	**0.0747% (1)**	0.2854	*99.75%*	**0.1624%**	1.6116
Skewed Student distribution					
5%	1.8449%	9.3567*	*95%*	0.0833%	0.0166
2.50%	1.3606%	10.8340*	*97.50%*	0.1293%	0.0769
1%	0.5618%	4.6058*	*99%*	0.3865%	1.9971
0.50%	4.7371%	93.0795*	*99.50%*	0.3247%	3.2293
0.25%	**0.0747% (1)**	0.2854	*99.75%*	**0.1624%**	1.6116

Table 5. Long and Short position VaR calculated by GJR-GARCH(1,1) in crisis period

Long position VaR			Short position VaR		
Quantile	Sample coverage	LR statistic	Quantile	Sample coverage	LR statistic
Normal distribution					
5%	1.8841%	1.8551	*95%*	1.01%	0.6408
2.50%	**0.0362%**	0.0015	*97.50%*	0.33%	0.1259
1%	0.4493%	0.4941	*99%*	**0.09%**	0.0205
0.50%	4.2754%	16.3972	*99.50%*	0.22%	0.2457
0.25%	0.1123%	0.1225	*99.75%*	0.25%	NaN
Student distribution					
5%	0.7971%	0.352	*95%*	1.38%	1.2131
2.50%	0.3261%	0.1259	*97.50%*	0.33%	0.1259
1%	0.4493%	0.4941	*99%*	**0.09%**	0.0205
0.50%	4.6377%	20.9656	*99.50%*	0.14%	0.1164
0.25%	**0.2500%**	NaN	*99.75%*	0.25%	NaN
Skewed t distribution					
5%	1.3768%	1.2131	*95%*	1.52%	1.233
2.50%	1.4130%	2.8588	*97.50%*	1.49%	2.123
1%	1.0000%	NaN	*99%*	1.17%	2.8769
0.50%	5.0000%	NaN	*99.50%*	0.59%	1.4287
0.25%	**0.2500%**	NaN	*99.75%*	**0.47%**	1.6431

Table 6. Descriptive statistics calculated by GJR-GARCH-Student in the stability period and by GJR-GARCH- normal in the crisis period

Quantile	Long position VaR				Short position VaR			
	mean		Standard deviation		mean		Standard deviation	
	Stability	Crisis	Stability	Crisis	Stability	Crisis	Stability	Crisis
5%	-1.9132	-2.5138	0.4323	0.5480	2.0471	2.4684	0.4383	0.5480
2.50%	-2.3456	-2.9911	0.5273	0.6530	2.4969	2.9456	0.5372	0.6530
1%	-2.8896	-3.5459	0.6469	0.7751	3.0710	3.5005	0.6634	0.7751
0.50%	-3.2915	-3.9238	0.7352	0.8582	3.5015	3.8783	0.7581	0.8582
0.25%	-3.6915	-4.2739	0.8232	0.9352	3.9355	4.2285	0.8535	0.9352

Table 7. Descriptive statistics calculated by GJR-GARCH-Student in the stability period and by GJR-GARCH- normal in the crisis period

Quantile	Long position VaR				Short position VaR			
	mean		Standard deviation		mean		Standard deviation	
	Stability	Crisis	Stability	Crisis	Stability	Crisis	Stability	Crisis
5%	-2.0664	-2.5138	0.4707	0.5480	1.8718	2.4684	0.4082	0.5480
2.50%	-2.5357	-2.9911	0.5755	0.6530	2.2779	2.9456	0.4989	0.6530
1%	-3.1318	-3.5459	0.7085	0.7751	2.7905	3.5005	0.6133	0.7751
0.50%	-3.5761	-3.9238	0.8077	0.8582	3.1708	3.8783	0.6982	0.8582
0.25%	-4.0214	-4.2739	0.9071	0.9352	3.5510	4.2285	0.7830	0.9352

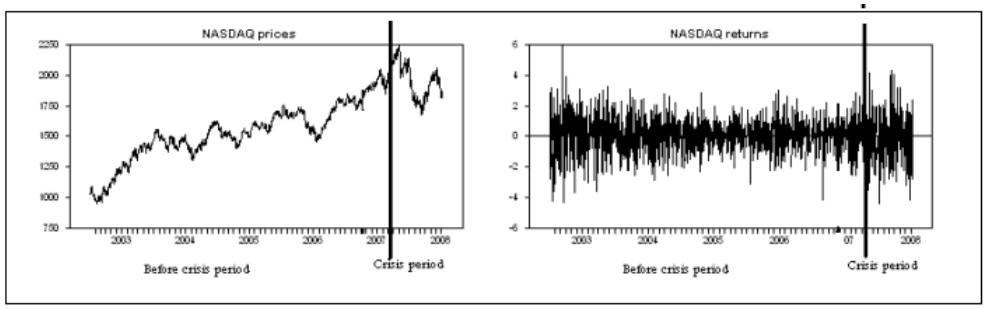

Figure 1. Graph of prices and return series in the two periods

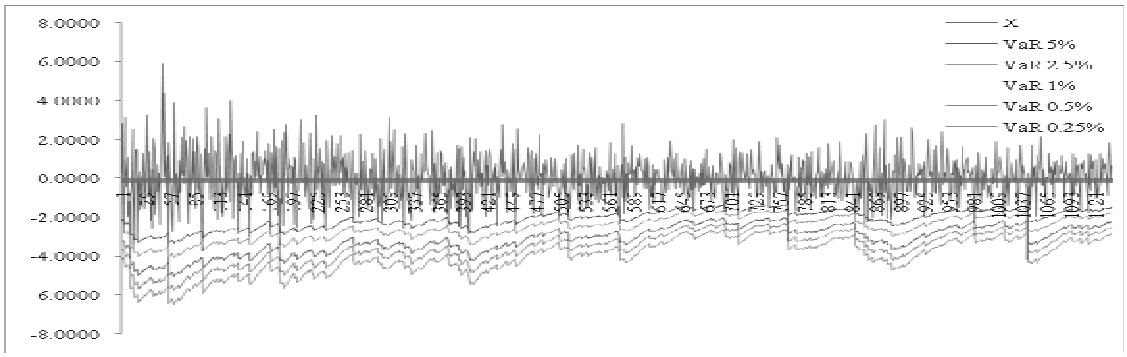

Figure 2. Returns (X) and long position VaR calculated by GJR-GARCH(1,1) with skewed Student t in the stability period

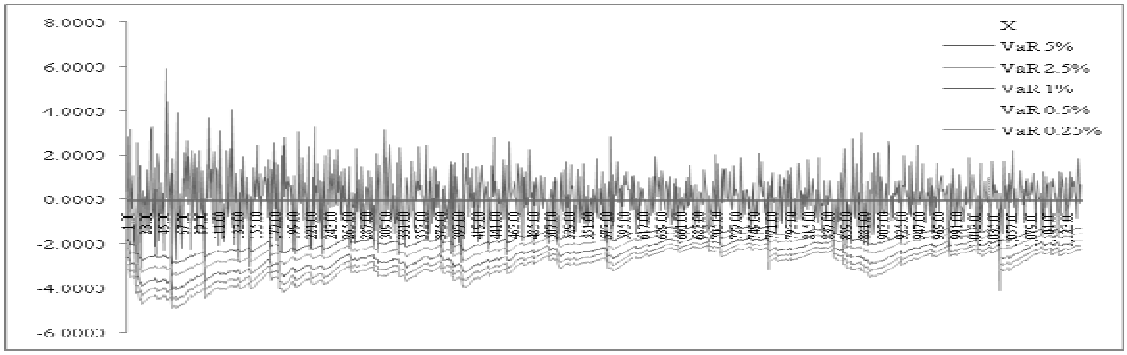

Figure 3. Returns (X) and long position VaR calculated by GJR-GARCH(1,1) with Student in the stability perio

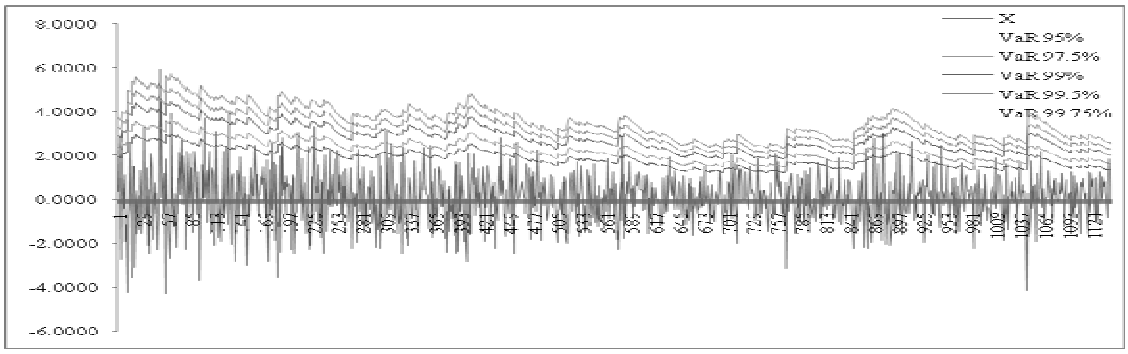

Figure 4. Returns (X) and short position VaR calculated by GJR-GARCH(1,1) with skewed Student t in the stability period

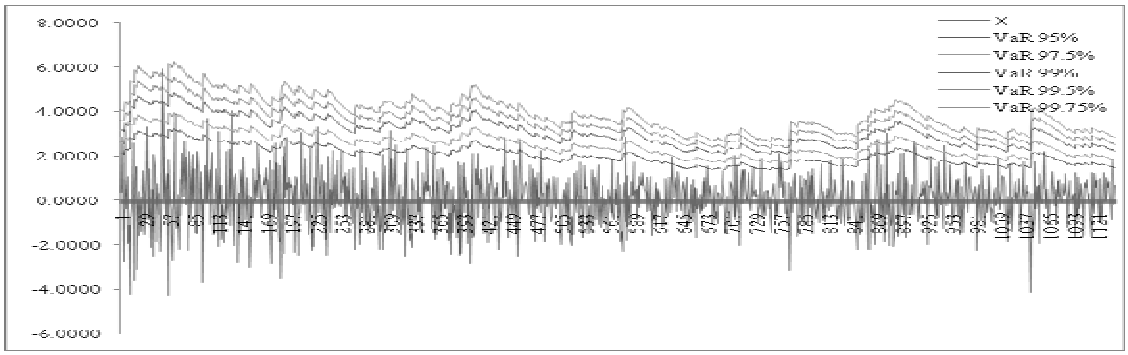

Figure 5. Returns (X) and short position VaR calculated by GJR-GARCH(1,1) with Student t in the stability period

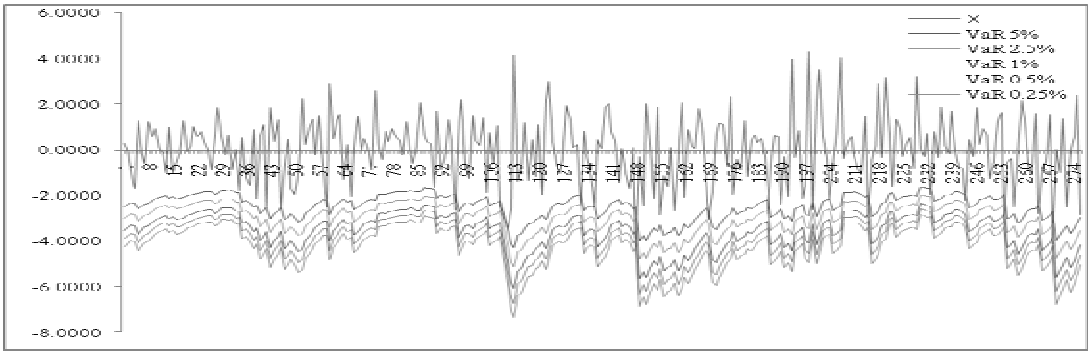

Figure 6. Returns (X) and long position VaR calculated by GJR-GARCH(1,1) with normal in the crisis period

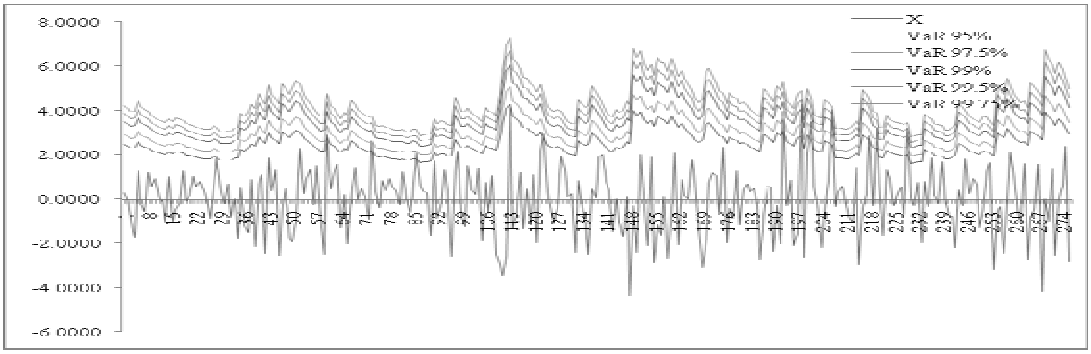

Figure 6. Returns (X) and short position VaR calculated by GJR-GARCH(1,1) with normal distribution in the crisis period

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Developing Policy for Suitable Harvest Zone using Multi Criteria Evaluation and GIS-Based Decision Support System

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Abstract

Natural resources management often entails making choices among alternatives. Decision support tools are instruments for making rational decisions, particularly geographical information system (GIS) technology-incorporates the multi criteria evaluations (MCE) and analytic hierarchy process (AHP). Therefore, the objective of this study is to determine the suitable forest harvest zone in hill tropical forest in Peninsular Malaysia using MCE and GIS as a tool for decision support system. The implementation of the AHP method for MCE has shown the capabilities of integration of a GIS and decision support system, where the data was prepared spatially in a GIS, an analysis is performed with the systematic evaluation method. The MCE allows both constraint and criteria maps to be combined in arithmetic operation in a suitability analysis, and also allows for criteria maps to be assigned variable weights. From the weights derived from the AHP method, it can be seen that slope and elevation were strong factors in allocating the suitable harvest zone (0.63 and 0.29). The hydrological aspect is the third most important factor, with 0.07. The total suitable area for productive forest zone was 9757.30 ha (96.06%) and the designated protected forest was about 399.20 ha (3.94%). This implies the importance of certain forest land to be classified as a restricted area for logging purposes to ensure the sustainable forest ecosystem and water resources. This result demonstrated that the methodology used has high potential and functionality for determining suitable forest harvest zone from several criteria for hill forest. Finally, it can be concluded that, MCE incorporating GIS provides an ideal tool and essential in modelling with flexibility and the ability for spatial modelling operation for site suitability study in hill forest of Peninsular Malaysia.

Keywords: Suitable harvest zone, Geographical information system, Multi criteria evaluation, Analytical hierarchy process

1. Introduction

Environmental pressure and increasing harvesting operations in hill tropical forest are observable in Malaysia. Currently, Malaysia has been practising sustainable forest management with the formulation of Malaysian Criteria and Indicators (MC & I), in compliance with the rules and procedures of the International Timber Tropical Organization (ITTO) and ISO 2001 for its forest. MC & I comprise various activities and standards of performance: specific policies, regulation, procedure, plan and guideline for international certification purposes. Khali (2001) reported some of the MC & I guideline was no harvesting operation on the slopes above 40 degrees, and adequate buffer zones reserved on river banks, for soil and water protection. Allocation of suitable forest harvest zones involves decision making on how to use available forest land to satisfy user need and environmental constraints. Marshal (1988) states that the decision is based on several ecological criteria and that user preference are often conflicting. Thus, in making a decision, the impact of satisfying each objective and environmental aspects must be considered. A participatory decision making process using a GIS as a support tool can help in solving technical and logistical problems.

Although the use of the standard GIS alone can greatly assist in selecting harvesting zones that simultaneously satisfy pre-determined criteria, it does not assist the user with specific tools for evaluating and making decisions about problems involving multi criteria evaluations (MCE) and potentially conflicting objectives (Carver, 1991). The advent of GIS and its modelling capabilities allows this process to be automated and make forest zoning procedures more efficient and timely. A GIS handles enormous amounts of data that become information when a model is used to transform the data into the evaluation of possible courses of action. MCE provides a means of structuring the information needed to assess complex decision problems for determining suitable forest harvest zone. With the recent developments in GIS, forest managers increasingly have available information systems with more accessible, easily combined and flexible data that meet the requirements of environmental decision making. In these circumstances, it is expected that the decision making process should become better informed, more easily and consistently.

The objective of this study therefore to determine the suitable forest harvest zone in hill tropical forest in Peninsular

Malaysia using MCE and GIS as a decision support system. The zoning objective is to define the protected and productive forests. The protected forest zone is to safeguard water supply and prevent soil erosion, and the productive forest will supply in perpetuity wood resources for the socio-economic development of the country.

1.1 Multi criteria evaluation (MCE) and GIS

Multi criteria evaluation is a structured process to define objectives, to formulate criteria and to evaluate solutions to a decision problem (Pullar, 1999). Many land-related problems require the evaluation of multiple criteria based upon spatial properties and preferences. GIS provides the processing capability to assess spatial criteria as a part of a multi criteria evaluation (MCE) procedure (Carver, 1991). The benefit of using a geographical information system (GIS) is that constraints can be based upon spatially related data, such as distance to a road. GIS is a suitable computing tool for performing the MCE analysis (Jankowski, 1995).

The most prevalent procedure for MCE and GIS integration for land suitability analysis use the linear weighted combination (LWC) approach developed by Eastman et al (1995). In this approach, land information is transformed to a set of factors over the study area. These factors are combined by applying a weight to each factor, followed by overlay summation to obtain a suitability map. This map can be used directly to satisfy a single objective or multiple objective analysis procedure applied to allocate areas according to the highest ranked objective. It can include judgment by the decision maker (as factor and weight) to influence the result. The suitability, S is computed as:

$$S = \sum (Ai \ X \ Wi) \quad \text{.....(1)}$$

where,

S = Suitability

Ai = Criteria score of factor i

Wi = Weight of factor i

The logic that lies behind multiple criteria evaluation is to compute a combined suitability score for each location, and then rank the most suitable location to arrive at the best solution as illustrated in Figure 1. A set of standardised factors Ai and their respective weights Wi are combined by additive computation to produce a suitability map S. In most applications there is an additional step to identify the best sites R using a decision rule based upon a heuristic choice. Typically this is done by priority ranking the values in S and allocating the best number of sites. An example would be identifying the best amenity areas in a forest as a combination of factors for proximity to walking tracks and streams, moderate relief, and away from conflicting land uses such as logging. These factors can be computed using a cartographic model (Tomlin, 1991). Once a combined suitability score is obtained by equation above, then a specified number of hectares are chosen from the highest ranked values for further investigation as amenity land uses. Linear weight combination (LWC) of factors Ai to derive suitability scores S are evaluated by simple decision rules (e.g. choose best site R from rank order of S). In summary, a linear combination technique can be used to evaluate suitability areas and to assign the best area for a specific activity.

A primary issue in the evaluation is to assign weights to each criterion separately. A set of relative weights for influential criteria has to be developed in advance to be used as input for suitability evaluation. In this case analytic hierarchy process (AHP) is appropriate method for deriving the weights. The application of AHP in decision making was developed in the late 1970's and has become one of the most widely used techniques as shown by the extensive literature published in journals and books, mostly in areas outside natural resources management (Schmoldt et al., 2001). The AHP allows users to assess the relative weight of multiple criteria (or multiple alternatives against a given criterion) in an intuitive manner. Its major innovation was the introduction of pairwise comparisons-research which showed that when quantitative ratings are unavailable, humans are still adept at recognizing whether one criteria is more important than another. The AHP method established a consistent way of converting such "pair wise" comparisons into a set of numbers representing the relative priority of each criteria.

Several applications to forestry can be found in published material including forest management (Schmoldt et al., 1994; Mendoza, 1997); forest planning and decision making (Kangas et al., 1992, Pukkala and Kangas, 1996). As land use and land resources become more constrained and the land allocated to various activities continues to shrink, suitability analysis takes on added importance. The MCE and AHP processes not only offer some advantages over traditional decision methods, but can be integrated with other approaches such as spatial decision support systems involving GIS to take advantage of their strengths.

2. Materials and method

2.2 Description of study area

The study area is in the Sungai Tekai forest reserve in Pahang State, Peninsular Malaysia, about 240 km north-east of the Kuala Lumpur city. It is situated within latitude 04°10´N - 04°30´N and longitude 103°03´E - 103°30´E, covering an

area of approximately 10,000 hectares (Figure 2). The forest area is composed of mixed virgin hill forest, high in species diversity with predominance of Shorea species such as Meranti Seraya (*Shorea curtisii*) and Meranti Rambai Daun (*Shorea acuminate*). The elevation is mostly over 600 m above sea level. The slope gradient of the study area is undulating with steep rugged slopes ranging from 100 to 800. The annual precipitation is about 210cm with a high tropical climate with mean temperatures ranging from 20^0C -31^0C. The precipitation occurs mainly in two seasons: April to May and November to December. The relative humidity is high ranging from 62.3% to 97.0%, with a daily mean of 85.7%.

2.3 Methods

To meet the objective, several criteria needed to be identified, integrated and evaluated. The approach utilised, as the basis for the identification of a suitable harvest zone in hill forest was using spatial decision support system and MCE process. The suitability map were ranked and grouped in order to identify the zone of forested land that is most suitable for the harvest operation. This zone met the requirements specified by the chosen criteria. When determining suitable harvesting zone, the goal is to minimize negative environmental effects in the forest area. The cartographic model for the suitable allocation and the proposed solution from the decision support system are summarized in the flow chart shown in Figure 3 and 4.

2.4 Set the objective

Although the objective of the study is to determine a suitable zone for forest harvesting within the study area, the system also considers complementary objectives. Complementary objectives need to be satisfied simultaneously, e.g. the area can be zoned to combine for productive forest and protected forest. The selection of both areas must satisfy the objectives.

2.5 Collection and collation of data

The inputs to the GIS include various digitised databases of maps, remote sensing data, information from tables and reports. The selection of data sources should be influenced by the nature of the problem to be investigated. The collection of data to generate a GIS layers for this study are topographical map (scale 1:50000) and forest resource map (scale 1:50000).

2.6 Database design and development

Database design involves the identification of information required for the GIS analysis. Most of the data were available in analogue form, and then organised into GIS database to facilitate spatial modelling to generate new information and support decision making. The data were edited, georeferenced and topology constructed to make them usable for next step in GIS analysis. Simultaneously, database developments came together with the criteria which were selected. Criteria were presented as continuous value maps. Four criteria and constraint maps were created. The GIS database design in the study is shown in Table 1.

2.7 Identification/selection of appropriate criteria

Identification of criteria is a technical process, which is based on theory, empirical research or/and common sense. In this study, criteria identification was done through consulting with a group of professional foresters and the Pahang Forest Department about the suitable zone for harvest operation. In this section, the criteria for determining the suitability of forest zone for harvest are provided. It should be noted that this selection is not exhaustive, and that only those criteria for which information is available were considered. Soil series is excluded in this study because the land is covered by virgin forest, and from the foresters' point of view the soil series is not a critical for determining a suitable harvest zone.

In planning the zoning, extreme pressures of environmental constraint can be restricted to more fragile ecosystems. Two criteria groups comprising four separate sets of forest geo-environmental attributes were used for the suitability evaluation (Table 2). They are topography (slope and elevation) and hydrological aspect (River buffer and lake buffer). Topography is an important determinant of suitability assessment. Elevation is considered because high forest areas suffer from inaccessibility, are fragile to any disturbance and it is important to protect them. Slope is even more important when considering the ease of engineering forest road construction and susceptibility to land sliding. Since pollution is a concern, river buffer and lake buffer areas was taken into account due to their importance in protecting the water resources from soil erosion. The distance of harvest area to the water sources were important to control debris flow during the rain season.

2.8 Standardization (rating) of criteria

In the evaluation process of the criteria, a primary step is to ensure a standardization measurement system across all the criteria considered. Since most of the maps still hold their own cell or original value, these have to be standardised to a uniform suitability rating scale. The standardization of criteria needs to combine the factor layers in creating a single ranked map of suitability ratings for the suitability harvest area. In this case study, scales of 1 to 4 are used. Assigning

values to specific factors amounts to making of decision rules in the shape of a threshold for each criterion. Numbers ranging from 1 to 4 were assigned to not suitable, marginally suitable, moderately suitable, and highly suitable, respectively. The fundamental terms of land suitability are adopted from the FAO framework 1977 and re-defined in forestry applications.

Standardization is performed by assigning numeric values to different levels of suitability within each factor, map layer or theme. In this standardization, it should be noted that statistical and empirical guidelines from the related national code and literature were used to determine the boundary value for rating purposes. In this case, broad categories of forest zone from the Forestry Department of P. Malaysia were applied. They were Productive Forest and Protected Forest as clarified in Table 3. The standardization criteria for these forest zones were divided into forest zone from an economic point of view and forest function. The parameters use for setting the suitability threshold with regard to economic reason were taken from National Forest policy 1992 and National Forestry Act 1993,report by Muziol (1999) under a Malaysian-German Technical Cooperation Project for sustainable forest management and conservation. In designing a hydrological buffer, reviews of related scientific literature were carried out (see Wenger, 1999; Hodges and Krementz, 1996; Keller et al., 1993; Kinley and Newhouse, 1997, Spackman and Hughes, 1995 and Mitchell, 1996). Table 4 show the class boundaries and standardised measurement employed for each criterion.

2.9 Allocation of criteria weight

A weighting process is subjective and is carried out through pairwise comparison between the criteria. Different criteria usually have different levels of importance. The analytical hierarchy process (AHP), a theory for dealing with complex technological, economical, and socio-political problems (Saaty, 1977; Saaty, 1980; Saaty and Vargas 1991), is an appropriate method for deriving the weight assigned to each factor. The weighing scale used consists of nine qualitative terms that are associated with nine quantitative values (Table 5). When the criteria on the vertical axis are more important than the factors on the horizontal axis, this value varies between one and nine. Conversely, the value varies between the reciprocal 1/2 and 1/9. The pairwise comparisons are the input of the AHP model that calculates the relative priority of each criterion. In calculating the relative priorities, AHP uses the eigenvalues and eigenvector of the pairwise comparison matrix (Saaty, 1980). However, in this study an approximation approach was applied because it is much easier to understand.

The pairwise comparisons are represented in a matrix as shown in Table 6. Three criteria, elevation, slope and hydrology, are the most appropriate for determining the suitability area for forest harvest zone based on the foresters opinions. This matrix reflects the fact that slope criteria are preferred to elevation criteria, and very strongly preferred to hydrology, while, elevation is strongly to very strongly preferred to hydrology. The main diagonal is always equal to unity (1st). The reciprocal values are allocated to the comparison: for example if the criteria of elevation are allocated the value of 6 relative to hydrology, then the hydrology criteria should receive a value of 1/6 relative to elevation. For each column the totals are calculated. The columns are then normalised by dividing each value by its column total. The normalised pairwise matrix is displayed in Table 7. Finally, Table 8 shows the relative importance or priorities for each criterion, determined by calculating the mean of the value in a row of Table 7. Thus, in this case, the following weights for the three criteria are obtained from the matrix in Table 7(Slope: 0.298, elevation: 0.632, and hydrology: 0.069).

2.10 Consistency ratio

In the construction of this pairwise comparison, the consistency of the judgement should be revealed because this matrix is a consistent matrix. To examine the consistency of selection of pairwise comparison, the parameter used to determine whether the result is acceptable or not, consistency ratio (CR) can be used (Saaty, 1977). A consistency ratio of the order 0.10 or less is a reasonable level of consistency. A consistency ratio above 0.10 requires revision of the judgement in the matrix because of an inconsistent selection of particular criteria rating. The consistency ratio (CR) was determined by the following process. The matrix for the criterion is made as follows:

1	1/3	6
3	1	7
1/6	1/7	1

The relative importance (weight) determined for each criteria were elevation; 0.298, slope; 0.632 and hydrology; 0.069. From the weight, the Weighted Sum Vectors were evaluated by multiplying these two matrices:

1.000	0.333	6.000		0.298	
3.000	1.000	7.000	X	0.632	=
0.167	0.143	1.000		0.069	

(1.000 X 0.298) + (0.333 X 0.298) + (6.000 X 0.298)	=	0.923
(3.000 X 0.632) + (1.000 X 0.632) + (7.000 X 0.632)	=	2.009
(0.167 X 0.069) + (0.143 X 0.069) + (1.000 X 0.069)	=	0.209

From the weighted sum vector, the Consistency Vector was calculated by averaging the weighted sum vector:

Consistency vector =	0.923 / 0.298	=	3.097
	2.009 / 0.632		3.179
	0.209 / 0.069		3.029

The average value of the above results were get (λmax) in the Consistency Vector were as follows:

$$\lambda_{max} = \frac{(3.097 + 3.179 + 3.029)}{3}$$

$$= 3.102$$

Now, the *Consistency Index* (CI) can be calculated using the following formula:

$$CI = (\lambda_{max} - n)/ n - 1$$

Where λ_{max} is the largest or principle eigenvalue of the matrix and can be easily calculated from the matrix, and *n* is the order of the matrix or criteria.

$$CI = \frac{(\lambda_{max} - n)}{n - 1}$$

$$= \frac{3.102 - 3}{3-1}$$

$$= 0.051$$

The Consistency Ratio, which is a measure of how much variation is allowed, can now be evaluated from CR = CI/RI, where RI is the Random Index depending on the order of the matrix (n) given by Saaty (1977) in the following table:

n	RI
2	0.00
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41

For the selected criterion, the *Consistency Ratio* is:

$$CR = \frac{0.051}{0.58}$$

$$= 0.088$$

In this case the consistency ratio of the matrix of paired comparisons between the three influential criteria in the suitability assessment is 0.088, and is thus an acceptable range for consistency. Once a satisfactory consistency ratio is obtained, the resultant weights are applied. The weight should add up to a sum of 1.0, as the linear weight combination calculation requires. The final step in the multi criteria AHP is to combine the average normalised criteria with the criteria scores to produce an overall rating for each criterion for suitability index.

2.11 The constraints

In order to achieve the objective to define protected zones, three constraints were identified which restrict the area that can be harvested. The constraint is referred to as the local regulation and guideline. The following constraints were

specified and shown in Table 9. The constraints were expressed in the form of a boolean map in a GIS. The area which is excluded from consideration was coded zero (0) and the area which remains for consideration was coded with a one (1).

2.12 Multi criteria evaluation (MCE)

MCE with a complementary objective approach was used in modelling the suitability forest harvest zone. MCE evaluation is used to combine a set of criteria to form a single suitability map according to a specific category. The proposed approach in this study is based upon satisfying a set of constraints in the evaluation. This is illustrated in Figure 5. As before (Figure 1), the suitability zone, S, is derived with a linear weight combination (LWC) procedure, but now the decision rule weight the choice of the best area by considering a set of boolean constraints. Constraints are areas which have no suitability. The relationship can be expressed mathematically as:

$$S = \sum (A_i \times W_i) \times \pi C_j \quad \ldots\ldots(2)$$

where,

S = Suitability to the objective

A_i = Criteria score of factor i

W_i = Weight of factor i

C_j = Value of constraint j (0/1 of constraint j)

π = Product of constraints

2.13 Data analysis and modelling

The true strength of GIS lies in its functionality of spatial analysis and modelling. Model based-raster data were utilized in this study. According to David (2002) raster is grid cells with a fixed number of row and columns that have several tables associated with them. Raster is different from vector data model because they may represent a continuous surface instead of a discrete feature. GIS data within raster model have several advantages relative to the vector GIS data. Raster allows for faster analysis and operation, especially for any overlay and buffer type analysis (Dangermond, 1990). Raster also allows for modelling continuous surfaces such as determining optimal path through a surface. For this reason the raster data model was primarily utilised in this study. The raster grid cells were defined and represented at 5m resolutions. This permitted a closer approximation of spatial continuous geographic features.

Several map based raster cells were then generated, especially the distance calculations between raster cells (e.g. distance from river buffer and lake buffer). The data layer of criteria that affect the suitability of the forest harvest zone were then reclassified so that they could be used as the rating maps required in this process. The calculated weight values were then transferred to the Arc View GIS, to create a suitability map with a value range per cell matching that of the standardised criteria map using a range 1-4. For the suitability maps a four equal interval classification between the minimum and maximum cell value calculated was employed, e.g. assigning the four ranges in increasing order, from not suitable, marginally suitable, moderately suitable, and highly suitable, respectively. Criteria and constraint maps were combined using the map calculation function to produce a suitability site for the proposed harvest zone area using equation (2). Finally, the resulting raster map was then vectorized. The final maps of constraint and suitability area are illustrated in the results and discussion section.

2.14 Preliminary criteria and constraint maps

After the Multi-Criteria Evaluations were performed for the three groupings of criteria, preliminary MCE maps were created illustrating the areas that were most suitable for the locating of forest harvest zones related to slope, elevation and river buffer. The constraint map that illustrates suitable and unsuitable areas for harvesting forested land in terms of slope, elevation, river buffer and lake buffer was also created. The rationale of dividing criteria and constraints into preliminary maps and then a final suitability map was based on two main reasons;(i) The division of criteria allowed for several 'checkpoints' to ensure that maps were being produced properly;(ii) This method allowed for criteria to be weighted within the preliminary MCE's based on their priority, but the weighting between the preliminary MCE's was equal. Thus, the priority of slope, elevation and river buffer could remain equal, yet the factors within each MCE had already been considered in the creation of the preliminary maps.

3. Results and discussion

The suitability harvest zone was divided into two stages. The preliminary stage outlined two main classes: (1) suitable and (0) not suitable. In the next stages, suitable class was further divided into different levels of suitability. The area illustrates the not suitable to highly suitable area using the scale of 1 to 4 categories and excludes all areas deemed unsuitable by the constraint map. The modelling results at this stage are highly sensitive to the weights applied (Van der Merwe, 1997; Dai et al. 2001). The priority weights assigned to various criteria will have an effect on the results. The final constraint map and final combined criteria map from the economic perspective for suitability harvest zone is

shown in Figure 6 and 7. The final suitable forest harvest zone map from economic perspectives was obtained by calculating weighted overlap map in arithmetic overlay function by combining the two images to produce images as shown in Figure 8.

Most of the forest area in Sungai Tekai Forest Reserve was identified as being suitable for harvesting. The forest harvest zone is clearly concentrated in the area where high topographical, steep slopes and hydrological buffer areas are avoided. This is to be expected as all of the contribution criteria for suitability harvest area are included. The major areas that are identified as suitable for harvesting lie on the south-west region of the study area. The area is appropriate since it is located below 1000 m and on slopes lower than 40 degrees. The unsuitable area is located in the eastern region. The areas identified as not suitable for harvest operations were more strongly influenced by slope and elevation than by other criteria. Statistically, the preliminary analysis of the entire study area showed that the suitable harvest zone area was about 9215 ha. There are only about 941 ha. were classified as not suitable from the economic perspective, thus remaining as a protection forest zone. This area embraces the established constraints such as excessive slope, and steepest terrain and is located in fragile zones like river and lake buffer. Tabular results were illustrated in Table 10.

The second stage of suitability classes included marginally suitable, moderately suitable, highly suitable, and not suitable classes. The predominant classes were highly suitable, followed by not suitable and moderately suitable. The substantial difference in classes between the preliminary stage and second stage is due to the fact that an individual weight for each spatial layer in GIS was included according to their importance to forest management and development. Traditionally, the evaluation and mapping suitable harvest zones were laborious and time consuming tasks because of the large amounts of data required for the manual handling and processing of spatial data. The implementation of this procedure produced a high degree of consistency and reduced time and field evaluation.

The use of MCE and AHP will enable the forestry department to evaluate the option of forest harvesting operation more thoroughly, quickly and flexibility. Thus, more forest area such as Permanent Forest Reserve can be classified into productive and protected forest, before harvesting operations take place. Hence, planning future forest harvesting areas will exclude the protected forest zone. This will reduce the areas that have potential for harvesting. This is in line with sustainable forest management practice in Malaysia. Furthermore, the system also enables planners to visualize the forest area in spatial format. The spatial map can show the spatial implications of the decision as a platform for discussion and negotiation between the forestry department and loggers.

4. Conclusion

The study of site suitability modeling and GIS draws knowledge from a wide range of disciplines; land suitability analysis, multi criteria evaluation, AHP weighting method, cartographic modeling and decision making theory. This study revealed that integrating GIS and MCE for decision making in the allocation of suitable forest harvest zones from several criteria can be important in the forestry sector. The total suitable area for productive forest zone from economic perspective is 9757.30 ha (96.06%) and the designated protected forest is about 399.20 ha (3.94%). The environmental perspective is very different, where the productive zone represents about 8221.59 ha. (80.95%) and the protected zone was 1934.90 ha. (19.05%). This implies the importance of certain forest land to be classified as a restricted area for logging purposes to ensure the sustainable forest ecosystem and water resources. The implementation of the AHP method for MCE has shown the possible integration of a GIS and decision support system, where the data is prepared spatially in a GIS, an analysis is performed with the systematic evaluation method and the result of the analysis is displayed in the cartographic form. The MCE method and GIS technology that used raster based applications are practical to use. An MCE allows both constraint and criteria maps to be combined in arithmetic operation in a suitability analysis, and also allows for criteria maps to be assigned variable weights. The technique can be easily replicated and the model could be improved with time for other forestry applications. The determination of weights for applied criteria is one of the most important challenges. From the weights derived from the AHP method, it can be seen that slope and elevation were strong factors in allocating the suitable harvest zone (0.632 and 0.298). The hydrological aspect is the third most important factor, with 0.069. It can be concluded that, MCE incorporating GIS provides an ideal tool and essential in modelling with flexibility and the ability for spatial modelling operation for site suitability study in P. Malaysia.

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Table 1. GIS database design

GIS database		
Topography	**Hydrology**	**Forest resource map**
Contour map	River	Forest boundary
Slope map	River buffer	Forest compartment
Elevation map	Lake	Timber volume map
Aspect map	Lake buffer	

Table 2. The criteria and justification in determining suitable harvest area

Criteria	Justification
Elevation (m)	The suitable harvest area should not be high because the high forest area requires protecting from excessive erosion.
Slope (Degree)	The suitable harvest area should not be on very steep slopes. It is important because of the safety and accessibility of the transportation.
Hydrological aspect (River and Lake buffer)	Harvest operation should avoid rivers and lakes. This is to protect water quality, lake ecosystem and to control the erosion of soil and debris into the water point. The establishment of hydrological buffer zone is also to protect wildlife an aquatic life.

Table 3. Definition use for Productive and Protected Forest.

Forest zone	Definition	Remark
Productive forest	This definition embraces forest area that can be harvested for the purpose of timber extraction and revenue collection. Intended to ensure supply in perpetuity of forest yield, principally timber for domestic purposes and export earning. However, the level of management or intensity of exploitation may be defined and change according to the current need and forest conditions.	The standardization was obtained from literature that refers to each criterion use.
Protected forest	Forest area legally under protection by legislation and guideline by Malaysian Forestry Department. This area must avoid any encroachment or any type of development. The protection is given priority to excessive slope, elevation and hydrological system. This includes protecting soil fertility and minimising damage by flood and erosion.	Authorised by legislation and local regulation/policy. Main objective is to protect physical condition of forest soil and environmental quality

Table 4. Standardization rating of each criterion from economic perspective

	Standardization rating/score			
Forest Zone	**Protected Forest**	**Productive Forest**		
Criteria	1	2	3	4
Slope (^{0})	> 40^0	$20^0 – 40^0$	$10^0 – 20^0$	$0^0 – 10^0$
Elevation(m)	> 1000m*	< 1000m		
River buffer(m)	0m-20m	> 20m		
Lake buffer(m)	0m-20m	> 20m		

1-Not Suitable; 2-Marginally Suitable; 3-Moderately Suitable; 4-Highly Suitable

**A new ruling by the Forestry Department P.Malaysia prescribed that harvesting not permitted beyond elevation of 1000 m asl.*

Table 5. Scale for pairwise comparisons

Numerical judgements	Verbal judgements
1	Equal importance
3	Moderately preferred
5	Strongly preferred
7	Very strongly preferred
9	Extremely preferred
2,4,6,8	Intermediate values between adjacent scales.
Reciprocals	For inverse comparison (when compromise is needed)

Table 6. The full pairwise comparison matrix for assessing the weight of criteria

Criterion	Elevation	Slope	River Buffer
Elevation	1	1/3	6
Slope	3	1	7
Hydrology	1/6	1/7	1
Total	4.167	1.476	14

Table 7. The normalised pairwise comparison matrix

Criterion	Elevation	Slope	River Buffer
Elevation	0.240	0.226	0.429
Slope	0.720	0.677	0.500
Hydrology	0.040	0.097	0.071
Total	1	1	1

Table 8. The relative importance (weight) for the criterion.

Criterion	Elevation	Slope	River Buffer	Weight
Elevation	$\frac{0.240 + 0.226 + 0.429}{3}$			= 0.298
Slope	$\frac{0.720 + 0.677 + 0.500}{3}$			= 0.632
Hydrology	$\frac{0.040 + 0.097 + 0.071}{3}$			= 0.069
Consistency ratio: 0.088				

Table 9. Three constraints identified in finding suitable harvest area

Constraint	Justification
Elevation (m)	No harvesting operation on elevation more than 600m* (from environmental perspective) and 1000m**(from economic perspective). The high forest area is very fragile and subject to excessive erosion, land sliding and it is important to protect the forested highland water resources. *Note:* **Environmental perspective applies the old ruling adopted by most of the states, harvesting is limited to below elevation of 600m asl.* ***A new ruling by the Forestry Department P.Malaysia prescribed that harvesting is not permitted beyond elevation of 1000 m asl.*
Slope (Degree)	No harvesting operation on slope more than 30 degree*(from environmental perspective) and 40 degree**(from economic perspective). Harvesting operation on the extreme slope is dangerous for heavy machinery and workers and difficult to access. *Note:* **Environmental perspective interest (Muziol, 1999)* ***Current threshold for timber production in Malaysia*
Hydrological aspect (Buffer zone)	No harvesting operation in < 20m* of sides of the river and surrounding lake (from economic perspective) and <100m**of sides of the river and surrounding lake (from environmental perspective). These hydrological aspects must be protected in order to supply clean water. On the other hand, buffer zone is required to protect the sediment flow entering the water course. *Note:* **Currently apply for riparian buffer by most States Forestry Department.* ***Environmental perspective interest: Streamside vegetation for stabilise stream bank.(National forestry Act 1993)*

Table 10. Total areas for each suitability ranking: Economic perspective

Stage	Suitability class	Area (m^2)	Area (ha)	%
Preliminary stage	Not suitable	9411138.61	941.11	9.26
	Suitable	92153908.52	9215.39	90.74
Second stage	Not suitable	3992046.24	399.20	3.93
	Marginally suitable	7032023.51	703.20	6.92
	Moderately suitable	9327394.62	932.73	9.18
	Highly suitable	81213582.73	8121.35	79.96
Forest zone				
Productive forest (Suitable for harvest)	Marginally suitable	7032023.51	703.20	6.92
	Moderately suitable	9327394.62	932.73	9.18
	Highly suitable	81213582.73	8121.35	79.96
	Total	**97573000.86**	**9757.30**	**96.06**
Protected forest(Including river buffer, lake buffer, elevation and excessive slope)	Not suitable	3992046.24	399.20	3.93
	Total	**3992046.24**	**399.20**	**3.93**

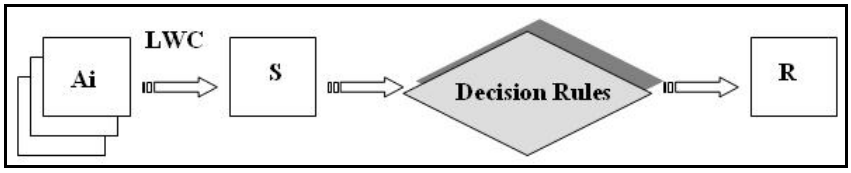

Figure 1. Land suitability modelling to derive best site R

Figure 2. A map of Peninsular Malaysia showing the study area in Pahang State.

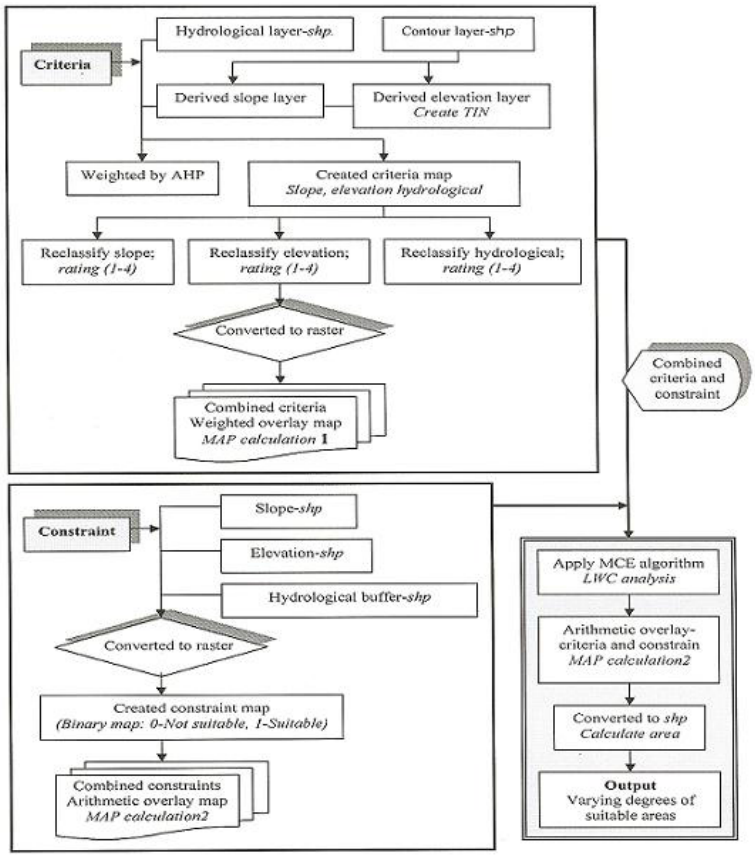

Figure 3. A cartographical model for suitable zone allocation

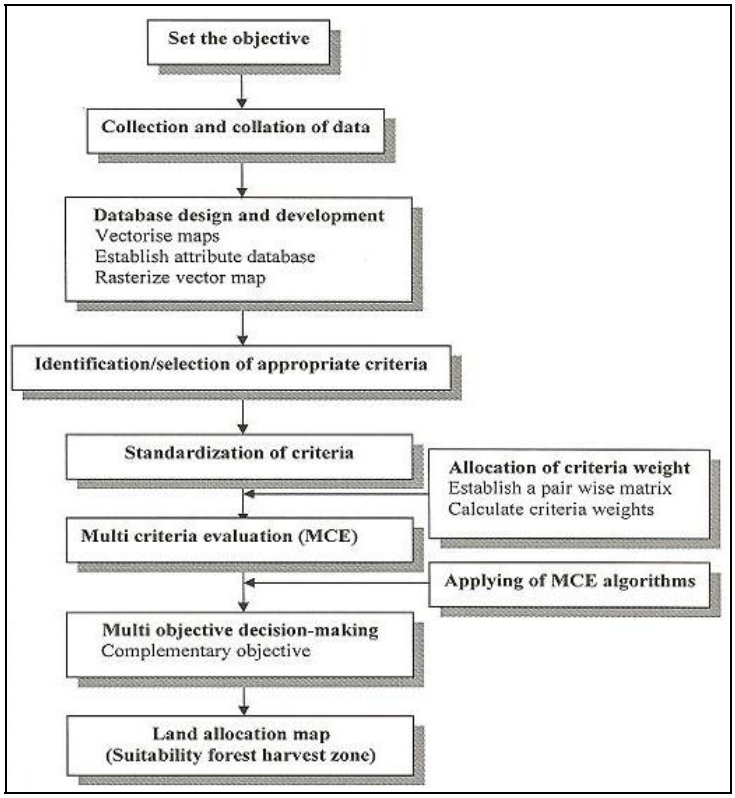

Figure 4. Flow chart for GIS evaluation for suitable forest harvest zone

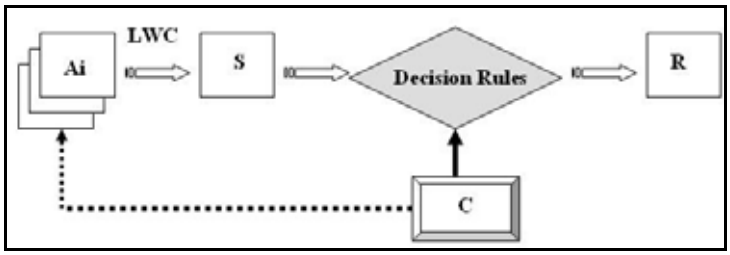

Figure 5. Land suitability modelling to derive best site R, with setting of constraint C

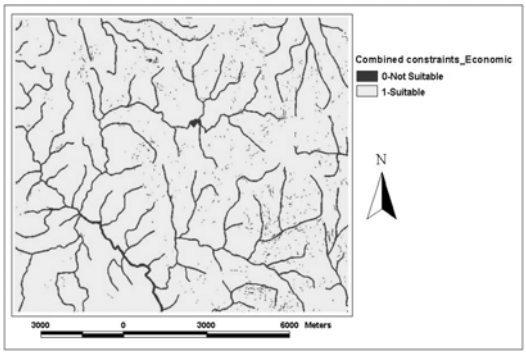

Figure 6. The final constraint map after combining constraint factors

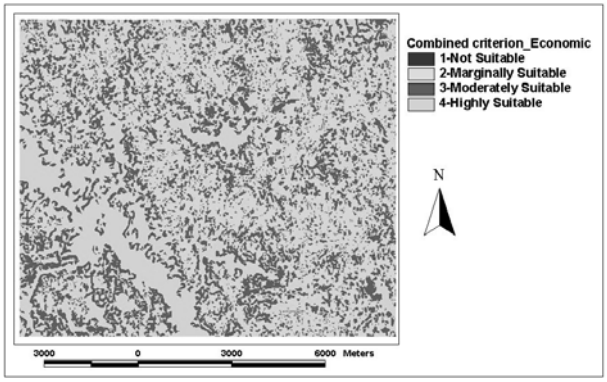

Figure 7. The final combined criterion map for suitable harvest zone area

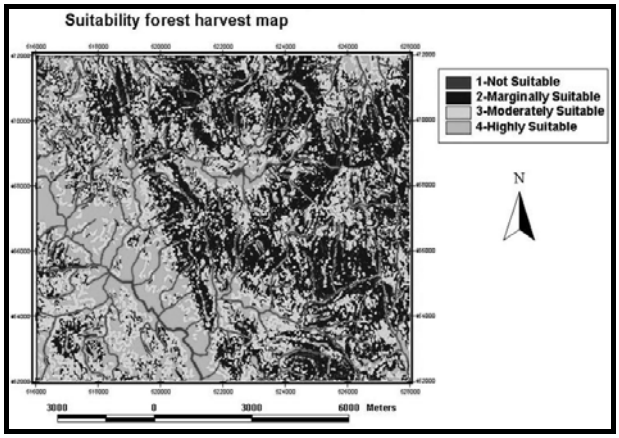

Figure 8. A suitable harvest zone map for the Sungai Tekai Forest Reserve.

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A New Nonparametric Approach to Price Convertible Bond Based on Random Interest Rate

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Abstract

This paper proposes an idea of combining the following two nonparametric approaches for two-factor convertible bond valuation. One is the stimulation of random rate, the interest rate term structure based on polynomial spine function was attained by only using historical data; Another is Canonical risk-neutral probability, which was attained by observed stock returns, so that the convertible bonds can be valuated by using equivalent martingale measure.

Keywords: Canonical valuation, Maximum entropy principle, Polynomial spine function, Random interest rate model, Risk-neutral probability

1. Introduction

Convertible bond (CB) is an intermediate between the stock and the pure bond, which becomes a more and more popular financial derivative. With the development of theory on pricing CB over 30 years, the CB pricing theory has formed two models including structural-form and reduced-form. The structural-form model aims to valuate the CB by analyzing the corporation's capital structure and taking the corporation value as a variable. Merton (1974) initially gave this method and argued that the corporation value obeyed a diffusion process, thus Merton considered the CB as a option written on corporation value. The method, however, does not work very well for the difficulty in observing the corporation value in the markets, which makes parameter estimators unavailable. Another model is reduced-form put forward firstly by McConnell & Schwartz (1986). This model takes the corporation stock as the underlying asset. Both of these two models can be called single- or multi-factor model according to the number of factors which affect the CB value.

Unfortunately, most of the existing models have their own weak points. For interest rate factor, it is usually assumed to obey a specific model so that its probability distribution is supposed firstly. But no any theory could explain which model is the best, moreover, the model will be verified through the relevant data. To atone for that, Ait-Sahalia (1996), Jiang (1998), Wang &Zhou (2006), Pan (2008) and Song & Lu (2008) offered semi-parameter or nonparametric rate models. For volatility factor, volatility, one of the most important parameters in modern options pricing, is unfortunately the only parameter that cannot be observed directly on the capital market. To bypass the problem of volatility estimation or volatility modeling as well as of making assumption about the distribution of the underlying altogether, Stutzer (1996, 2000) proposed the so-called canonical valuation method, a nonparametric approach, which derives a risk-neutral distribution (Canonical distribution) from the observed time series data of the underlying and then uses the resulted canonical probabilities to average the expiry payoff's directly to obtain the price of a European option. This approach which based on historical data is not subjected to any parameter model.

The paper proposes an idea of combining the two nonparametric approaches above for CB valuation. The remainder is structured as follows, the paper first estimates Government Bond Yields through an interest rate term structure model based on polynomial spine function, then the canonical risk-neutral probability is attained by observed stock returns, finished the convertible bonds can be valuated by using equivalent martingale measure.

2. Nonparametric interest rate model based on polynomial spine function

This section follows closely Wang &Zhou (2006) and uses the cubic spine function to estimate government bond yields.

2.1 Nonparametric interest rate model

Let $B(t,s)$ denote the t-time price of zero coupon bond (ZCB) which pays one unit cash at time s ; $B(s)$ refers to the discount spine function and means the 0-time price of ZCB which pays one unit cash at time s , obviously $B(0,s)=B(s)$; The discount factor on interval $[t_{i-1},t_i]$ is denoted by $B_{t_i}(s)$. The following is cubic spine function:

$$B(s)=\begin{cases} B_{t_1}(s)=1+c_1s+b_1s^2+a_1s^3, s\in[0,t_1] \\ B_{t_i}(s)=B_{t_1}(s)+\sum_{j=2}^{i}(a_j-a_{j-1})(s-t_{j-1})^3, \\ s\in[t_{i-1},t_i], i=2,3,\cdots n \end{cases} \tag{1}$$

Solve the model: $$\min_{a_i,b_i,c_i}\sum_{j=1}^{n}[P_j(t)-\sum_s C_j(s)B(s)]^2 \tag{2}$$

Where $P_j(t)$ is market price of j th coupon bond at time t and $C_j(s)$ denotes the cash flow of j -th coupon bond at time s .

a_i,b_i,c_i in (1) can be calculated using least square method. Lastly, ZCB rate $r(s)$ is given as follows:

$$r(s)=-\frac{\ln B(s)}{s} \tag{3}$$

The following example is to illustrate the solution procedure for nonparametric rate term structure.

2.2 Example for illustrating nonparametric rate term structure

Select 13 coupon bonds (see table 1) from Shanghai Stock Exchange and apply them to model (2) for optimal decision. The sample bonds span from 3 April 2008 to 9 May 2015 and their payment periods are one year. Let $t_1=1,t_2=3,t_6=6$, then the following is obtained using the 13 bonds data and by the approach above:

$$c_1=-.52767589, b_1=.61124586, a_1=-.21910044; a_2=-.01168983, a_3=-.01111107$$

Figure 2 is the zero coupon Government-bond rate term structure.

3. Canonical risk neutral probability

3.1 Equivalent martingale measure

The principle of pricing CB in this paper is Not necessary assuming the asset price obeys some process But only using the observed data to obtain the risk neutral probability. The reason is that information about underlying asset is in historical data and not dependent on any given model.

There are some denotations. Firstly assume CB expires at time T ; the current price of stock with independent returns is S_0 and $S(t)$ at $t\in[0,T]$; $D(t)$ and $r(t)$ denote individually the dividends and instantaneous rate at time t ; π and π^* represent the actual return probability and equivalent martingale probability; $\frac{d\pi^*}{d\pi}$ is Radon-Nykodym derivative(that's the risk neutral probability density); the increment $\Delta S(t)=\frac{S(t+\Delta t)}{S(t)}$.

In discrete time model(see Stutzer, 1996),

$$S_0 = E_{\pi^*}\left(\frac{S(T)+D(T)+\sum_{t=1}^{T-1}[D(t)\prod_{s=t}^{T-1}(1+r(s))]}{\prod_{s=1}^{T}(1+r(s))}\right) \tag{4}$$
$$= E_{\pi}\left(\frac{S(T)+D(T)+\sum_{t=1}^{T-1}[D(t)\prod_{s=t}^{T-1}(1+r(s))]}{\prod_{s=1}^{T}(1+r(s))}\frac{d\pi^*}{d\pi}\right)$$

The continuous one is considered in this paper.

3.2 Gibbs Canonical probability

Consider the non-dividend case: $D(t)=0(\forall t)$, each observed interval is Δt, $n=[\frac{T}{\Delta t}]$, n gross returns in market are denoted by $R(t)(=\frac{\Delta S(t)}{S(t)})$. Then the following can be attained by equivalent martingale measure condition(Longstaff,1995):

$$E_{\pi}[R(t)\cdot\frac{d\pi^*}{d\pi}]=\int_t^{t+\Delta t} r(s)ds \tag{5}$$

$E_{\pi}[\cdot]$ denotes the expectation operator under actual probability.

And formula (6) holds by maximizing entropy principle (Foster,1999):

$$\frac{d\pi^*}{d\pi}=\arg\min_{\frac{d\pi^*}{d\pi}}\int \ln\frac{d\pi^*}{d\pi}d\pi^* \tag{6}$$

Thus, the risk neutral probability can be computed using formulas above(the solution process need the feasible assumption “the returns are independent ”):

$$\frac{d\pi^*}{d\pi}=\frac{\exp(\gamma^* R(t))}{E_{\pi}[\exp(\gamma^* R(t))]} \tag{7}$$

Where γ^* is the value of the Lagrange multiplier that minimizes the following:

$$\min_{\gamma}\frac{E_{\pi}[\exp(\gamma R(t))]}{\exp(\gamma\int_t^{t+\Delta t} r(s)ds)} \tag{8}$$

$\frac{d\pi^*}{d\pi}$ in (7)products a kind of probability distribution called Gibbs Canonical neutral probability.

4. Pricing convertible bond (CB)

4.1 Analysis of CB

Let C_T be the value of CB with expiration date T; F is the CB face value; $P_b=F\cdot e^{iT}$ represents the value of straight bond with coupon rate i; C_c is the conversion price. The following is the analysis process. At expiration,

The stock value after converting into stock $\frac{F}{C_c}S_T$ is smaller than the face value F if stock price S_T is less than conversion price C_c. Then the bond holder would not convert the bonds into stocks and receive payments including principle and coupons from corporate, thus the CB just is the straight bond.

When stock price S_T is more than conversion price C_c but $\frac{F}{C_c}S_T$ less than pure bond value P_b, the holder will do the same as 1) and CB value equals to straight bond value P_b.

If converted stock value $\frac{F}{C_c}S_T$ is more than pure bond value P_b, the bond holder must exercise the option converting bonds into stocks to hold corporate stocks whose value just means the CB value.
Consequently, it can be concluded that from above:

$$C_T = \begin{cases} P_b & S_T < C_c \\ P_b & C_c \le S_T \le \frac{P_b \cdot C_c}{F} \\ \frac{F \cdot S_T}{C_c} & S_T > \frac{P_b \cdot C_c}{F} \end{cases} \tag{9}$$

4.2 Convertible bond valuation

Using Gibbs Canonical density $\frac{d\pi^*}{d\pi}$ and formula(9), the value of convertible bond with expiration date T can be calculated by the following expectation:

$$C_0 = E_{\pi^*}\left[C_T\right] = E_{\pi^*}\left(\frac{\max(P_b, \frac{F}{C_c}S_T)}{\int_0^T r(s)ds}\right) = E_{\pi}\left(\frac{\max(P_b, \frac{F}{C_c}S_T)}{\int_0^T r(s)ds}\frac{d\pi^*}{d\pi}\right) \tag{10}$$

There exist two small questions still to be handled. One is about $r(s)$ in (10), actually it can be attained through section 2 "Nonparametric interest rate model based on polynomial spine function"; Another is about the simulation of Gibbs-Canonical probability density, this also can be easily solved by the following steps: firstly calculate gross return $R(t)$ in proper observed time interval Δt, then simulate probability distribution of $R(t)$ and substitute it into (7)and(8) to compute Gibbs-Canonical probability density, finished with value of convertible bond from(10).

5. Conclusions and further researches

The discussed convertible bond in this paper is based on two factors (random rate and corporate stock) model. The pricing method for CB is nonparametric, that is, not necessary to assume any pricing model since the information from financial market can be reflected in relevant data. This method works totally by real observed data.

This nonparametric pricing method is in two aspects: one is the stimulation of random rate, The interest rate term structure based on polynomial spine function can be drawn by only using historical data, any given model is unnecessary. Another is Canonical risk-neutral probability, in fact, Canonical probability measure can be computed by directly using the historical stock data, thus the volatility estimation is skipped. This is the very "nonparametric" approach. The paper finished with calculating CB valuation by equivalent martingale measure.

Discussions further are as follows. This paper only proposes an idea of pricing convertible bond, does not give an empirical test, although Canonical approach is tested very efficient in pricing option. Besides, an improved Canonical approach with constraint(s) can be considered as Stuzer(1996).

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Codes for selected bonds
010103, 010110, 010112,
010203, 010307, 010503,
010308, 010404, 010410,
010505, 010509, 010513,
010605

Table 1.

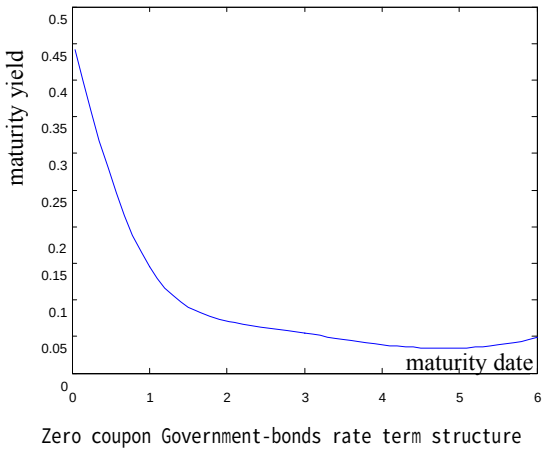

Figure 2.

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Consumption, Aggregate Wealth, and Expected Stock Returns in Japan

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Abstract

This paper studies the role of fluctuations in the aggregate consumption–wealth ratio for predicting stock returns in Japan. Using quarterly Japanese stock market data, we find three main results that are different from US evidence. First, unlike in the US, fluctuations in Japan in the consumption–wealth ratio are not strong predictors of real and excess stock returns. Second, we find that the dividend yield is a much better forecaster of future stock returns at short and intermediate horizons than is the consumption–wealth ratio in Japan. This is also a different result than from the US. Third, as opposed to the US again, the relative risk-free rate in Japan shows almost no ability to predict excess stock returns in Japan, while the corresponding relative T-bill rate exhibits rather strong forecasting power for excess stock returns in the US.

Keywords: Consumption–wealth ratio, Dividend yields, Excess stock returns, Payout ratios, Real stock returns

1. Introduction

The aggregate consumption–wealth ratio, investigated by the influential study of Lettau and Ludvigson (2001a), is an interesting variable to financial economists for understanding the theoretical and empirical linkages between macroeconomic variables and financial markets. Lettau and Ludvigson (2001a) demonstrated the strong forecast power of the consumption–wealth ratio for log excess stock returns using US data; thus, it is important to test its forecast power in other countries using country-specific data sets from an independent point of view. In the US, many studies, such as Campbell (1987), Sundaresan (1989), Constantinides (1990), and Campbell and Cochrane (1999), researched the cyclical variation of stock returns. Furthermore, regarding the consumption–wealth ratio, many studies in the US, (other than Lettau and Ludvigson (2001a)) such as Campbell and Mankiw (1989), Lettau and Ludvigson (2001b), Rangvid (2006), Lewellen and Nagel (2006), Guo (2006), and Ludvigson and Ng (2007), used this ratio in their studies. (Note 1) However, in Japan, studies on the consumption–wealth ratio are limited. (Note 2) Based on this motivation, our objective in this paper is to examine the forecast power of the aggregate consumption–wealth ratio for stock returns in Japan.

Our contributions are as follows. First, we show that the forecast power of the consumption–wealth ratio is very weak in Japan. At longer horizons, it shows some forecast power for excess stock returns in Japan. However, in contrast to the strong forecast power of the ratio in the US demonstrated by Lettau and Ludvigson (2001a), the degree of forecast power is much weaker in Japan than in the US.

Second, we find that in Japan, dividend yields demonstrate stronger predictability for excess stock returns than the consumption–wealth ratio. When dividend yields are included with the ratio in the same regression, the former almost always dominates the latter.

Third, again in comparison with the US, the relative risk-free rate has almost no forecast power for excess stock returns in Japan, while the corresponding relative bill rate shows rather strong predictability for excess stock returns in the US.

Furthermore, we focus on the reason why the return predictability of the consumption–wealth ratio is much weaker in Japan. Our detailed economic interpretation of this issue is also a significant contribution of this paper.

The rest of this paper is organized as follows. Section 2 very briefly reviews the theoretical framework linking consumption, aggregate wealth, and expected returns. Section 3 reviews the methodology for obtaining estimates of the consumption–wealth ratio from the observed values of consumption, labor income, and asset holdings. In Section 4, we explain the other financial variables used in this paper. We then test the one-quarter-ahead forecast power of the consumption–wealth ratio while including the other financial market variables from Section 5. Section 6 documents the long-horizon forecast power of the consumption–wealth ratio, Section 7 presents our interpretation of the results, and

Section 8 concludes the paper.

2. Theory and the Consumption–Wealth Ratio

Lettau and Ludvigson (2001a) presented a general framework linking consumption, asset holdings, and labor income with expected returns.

First, they documented the relation between consumption, wealth, and expected returns, as follows:

$$c_t - w_t = E_t \sum_{i=1}^{\infty} \rho_w^i \left(r_{w,t+i} - \Delta c_{t+i} \right), \tag{1}$$

where E_t is the expectation operator conditional on information available at time t. In addition, c denotes the logarithm of aggregate consumption, w denotes the logarithm of aggregate wealth, and according to their theory, ρ_w is the steady-state ratio of new investment to total wealth. In addition, $r_w \equiv \log(1 + R_w)$ and Δc is the one-period difference of log consumption, where R_w is the net return on aggregate wealth. Equation (1) implies that the aggregate consumption–wealth ratio can only vary if consumption growth or returns (or both) are predictable: namely, the consumption–wealth ratio is a function of expected future returns of the market portfolio.

By further analysis, Lettau and Ludvigson (2001a) derived the following equation, which describes the log consumption–wealth ratio using only observable variables on the left-hand side:

$$c_t - \omega a_t - (1-\omega) y_t = E_t \sum_{i=1}^{\infty} \rho_w^i \left[\left\{ \omega r_{a,t+i} + (1-\omega) r_{h,t+i} \right\} - \Delta c_{t+i} \right] + (1-\omega) z_t, \tag{2}$$

where a is the logarithm of aggregate asset holdings, y is the logarithm of aggregate labor income, ω is the average share of asset holdings in total wealth, r_a is asset returns, r_h is returns on human capital, and z is a mean zero stationary random variable, according to the definitions of Lettau and Ludvigson (2001a). (Note 3) In equation (2), they denoted the trend deviation term $c_t - \omega a_t - (1 - \omega) y_t$ as the consumption–wealth ratio, cay_t.

Lettau and Ludvigson (2001a) also stated equation (2) implies that "cay_t will be a good proxy for market expectations of future asset returns, $r_{a,t+i}$, as long as expected future returns on human capital, $r_{h,t+i}$, and consumption growth, Δc_{t+i}, are not too variable, or as long as these variables are highly correlated with expected returns on assets" (pp. 821).

3. Estimating the Trend Relationship among Consumption, Labor Income, and Asset Holdings

To estimate the consumption–wealth ratio, Lettau and Ludvigson (2001a) employed the following Stock and Watson (1993) dynamic least squares (DLS) technique: (Note 4)

$$c_{n,t} = \alpha + \beta_a a_t + \beta_y y_t + \sum_{i=-k}^{k} b_{a,i} \Delta a_{t-i} + \sum_{i=-k}^{k} b_{y,i} \Delta y_{t-i} + \varepsilon_t, \tag{3}$$

where $c_{n,t}$ is the log of nondurables consumption at time t, and Δ is the first difference operator; and they defined the estimated trend deviation, cay_t, using the actual data as $c_{n,t} - \hat{\beta}_a a_t - \hat{\beta}_y y_t$ (pp. 823). (Note 5) Furthermore, as before, a_t is the logarithm of aggregate asset holdings at time t and y_t denotes the logarithm of aggregate labor income at time t.

To obtain estimates of cay_t in Japan, we first use the sum of the 'nondurable goods' and 'services' consumption expenditure series of households as nondurables consumption. (Note 6) These two series are published by the Government of Japan in real terms, so we seasonally adjust the sum of the two series using the census X-12 filter method. Next, for asset holdings, we use the sum of 'financial assets, personal' and 'financial assets, households' from the Bank of Japan. Both are published in nominal terms; thus, we construct real values by deflating the series by the personal consumption expenditure (PCE) deflator from the Government of Japan, and then seasonally adjusting the deflated series using the census X-12 filter method. Furthermore, for labor income, we employ the nominal series of 'compensation of employees' from the Government of Japan. We deflate the series by the above PCE deflator, and then seasonally adjust the deflated series using the census X-12 filter method.

To view the estimates of cay_t graphically, we show the time series of cay_t with excess stock returns in Japan in Figure 1. Both series are normalized to an average of 0 and a standard deviation equal to 1.

4. Financial Data and Summary Statistics

Our quarterly financial data include real stock returns r_t, excess stock returns $r_t - r_{f,t}$, dividend yields (Note 7) $d_t - p_t$, the dividend–earnings ratio (Note 8) $d_t - e_t$, and the relative risk-free rate $RREL_t$, in addition to the estimates of cay_t mentioned previously. The sample period is from the second quarter of 1980 to the third quarter of 2002 throughout the paper.

First, r_t is constructed by using the value-weighted average return of the Tokyo Stock Exchange (TSE) First Section

listed stocks (from the Japan Securities Research Institute (JSRI)), and we deflate the series by the consumer price index (CPI) (from the Statistics Bureau, Ministry of Internal Affairs and Communications). Next, $r_t - r_{f,t}$ is the abovementioned return data from the JSRI minus the risk-free rate, for which we use the yields of traded bonds with repurchase agreements (from the Japan Securities Dealers Association) (Note 9) from the second quarter of 1980 to the second quarter of 1984, and the one-month median rate of the negotiable time certificate of deposit (CD) (from the Bank of Japan) from the third quarter of 1984 to the third quarter of 2002. (Note 10) Furthermore, $d_t - p_t$ is the log of the dividend yields for TSE First Section stocks (from the TSE), and $d_t - e_t$ is the log of the dividend yields for TSE First Section stocks (from the TSE) minus the log of the earnings for TSE First Section stocks (from the TSE). Furthermore, $RREL_t$ is the above risk-free rate minus its 12-month backward moving average. (Note 11)

Table 1 displays the summary statistics for the abovementioned financial variables. In this paper, our focus is on the estimated trend deviation variable, *cay*, in Japan. Thus, we here describe the situation by focusing on *cay* in Japan. This variable is contemporaneously positively correlated with the dividend–price ratio and the dividend–earnings ratio, as in the US. Furthermore, as in the US, *cay* has a contemporaneously negative correlation with the relative risk-free rate in Japan. However, *cay* has little contemporaneous correlation with excess stock returns in Japan, while it is positively correlated with excess stock returns in the US.

5. Quarterly Forecasting Regressions

We next assess the forecasting power of *cay* for asset returns. Table 2 shows a typical set of results using the lagged trend deviation, cay_t, as a predictive variable. The table reports one-quarter-ahead forecasts of the log real return and log excess return on TSE First Section stocks. In all of the regressions in Tables 2 and 3, we report the corrected *t* statistic using the Newey and West (1987) method. Describing the results for TSE First Section real stock returns (panel A of Table 2) first, neither the lag of real returns nor *cay* show forecast power. This is very different from the case in the US, where both variables displayed forecast power for real returns.

Next, for the TSE First Section log excess returns (panel B of Table 2), in Japan, as in regression 5, the first lag of *cay* shows very weak forecasting power. This is again very different from the case in the US, where Lettau and Ludvigson (2001a) demonstrated the significant forecast power of *cay* in the US in their Table III (pp. 828).

Finally, when we include the control variables (Note 12) in regressions following Lettau and Ludvigson (2001a) (panel C of Table 2), only the dividend–price ratio exhibits forecast power for log excess returns for the TSE First Section stocks, and again this is a very different result from the US case. The very weak forecast power of *cay* shown in panel B disappears under the effect of control variables. Hence, we conclude that only very limited stock return predictability is evident in the consumption–wealth ratio in Japan, using the one-quarter-ahead forecast tests following Lettau and Ludvigson (2001a).

6. Long-Horizon Regressions

Next, again following Lettau and Ludvigson (2001a), we test the return predictability of *cay* for the long horizon. Table 3 reports the results from the long-horizon regressions of log excess returns on the lagged variables. *H* denotes the return horizon in quarters. The dependent variable in panel A is *H*-period total consumption growth $\Delta c_{t+1} + ... + \Delta c_{t+H}$, and in panel B, the dependent variable is *H*-period nondurable consumption growth $\Delta c_{n,t+1} + ... + \Delta c_{n,t+H}$. Furthermore, in panel C, the dependent variable is the sum of *H* log excess returns on TSE First Section stocks, $r_{t+1} - r_{f,t+1} + ... + r_{t+H} - r_{f,t+H}$. The regressors are cay_t, the dividend yield, the dividend–earnings ratio, the detrended short-term interest rate, and combinations thereof.

Table 3 shows the results of the long-horizon forecasting regressions. First, panels A and B show that lagged *cay* is correlated negatively with both future total and nondurable consumption growth in Japan. Second, as regression number 3 shows, *cay* demonstrates weak forecast power for the future log excess stock returns in Japan. However, as the horizon increases, the forecast power of *cay* improves. Furthermore, as regression number 4 shows, the dividend yield again shows stronger forecast power than *cay*. When we use *cay* and the dividend yield as regressors simultaneously, as in regression number 5, the dividend yield demonstrates statistically significant and strong forecast power, while the weak forecast power of *cay* is mostly dominated and disappears. (Note 13) Similar to the results in Table 2, regressions number 6 and 7 show the dividend–earnings ratio and the detrended short-term interest rate again display almost no forecast power in Japan. Finally, when all four financial variables are included in one regression, only for the very long horizon such as $H = 8$ or 12 does *cay* show some forecast power for excess stock returns in Japan. However, this result is very different from the case in the US, where *cay* displayed very strong forecast power for excess stock returns by dominating other financial variables, as emphasized by Lettau and Ludvigson (2001a) (see Table VI, pp. 840).

Finally, Table 4 investigates the forecast power of the full VAR counterpart to the equations analyzed previously for long-horizon returns. Table 4 presents the results from estimating two first-order VARs. The first system is a four-variable VAR that includes the log excess returns for the TSE First Section stocks, the relative risk-free rate, the log dividend–price ratio, and the log dividend–earnings ratio. The second is a five-variable VAR that adds *cay* to the

previous system.

Panel A of Table 4 shows that, in the four-variable VAR system, only the dividend yield has forecast power for the log excess returns in Japan. Furthermore, panel B of the table displays that, again, *cay* does not show clear stock return forecast power in the five-variable VAR system.

7. Interpretation: Why is the Return Predictability of the Consumption–Wealth Ratio Weak in Japan?

This section interprets our empirical results. In particular, we attempt to clarify why the return predictability of the consumption–wealth ratio in Japan is much weaker than in the US. We address this issue from two perspectives. First, we consider the difference in the economic structure between Japan and the US. Second, we examine the difference in consumption behavior between Japan and the US.

7.1 The role of consumption in the macroeconomy in Japan and the US

First, we consider the difference in the role of consumption in Japan and the US from a macroeconomic viewpoint.

To consider this issue, we employ the following six additional variables: JGDP, JCONS, JINV, UGDP, UCONS, and UPDI. In order, JGDP denotes the quarterly log growth rate of real GDP in Japan; JCONS denotes the quarterly log growth rate of real consumption (nondurables and services) in Japan; and JINV denotes the quarterly log growth rate of real gross domestic investment in Japan. Similarly, UGDP denotes the quarterly log growth rate of real GDP in the US; UCONS denotes the quarterly log growth rate of real consumption (nondurables and services) in the US; and UPDI denotes the quarterly log growth rate of real gross private domestic investment in the US.

The data sources are the Government of Japan for JGDP, JCONS, and JINV, and the US Department of Commerce for UGDP, UCONS, and UPDI. The sample period is again from the second quarter of 1980 to the third quarter of 2002, for uniformity.

To obtain economic insights, in Table 5, we display the results of Granger causality tests for JGDP, JCONS, and JINV for Japan (panel A) and for UGDP, UCONS, and UPDI for the US (panel B).

Most importantly, consumption leads real GDP in the US; however, in contrast, consumption lags real GDP in Japan. In general, asset prices such as stock prices are forward-looking; thus, stock returns are expected to lead real GDP. However, in Japan, consumption lags real GDP; hence, consumption is considered to have little forecasting power for future stock returns in Japan. Therefore, from the lead–lag relationship, we can assume that the consumption–wealth ratio does not forecast future stock returns in Japan.

In contrast, in the US, consumption strongly leads the dynamics of the macroeconomy; thus, it is understandable that the consumption-based ratio, the consumption–wealth ratio, has good forecast power for future stock returns in the US, as Lettau and Ludvigson (2001a) demonstrated.

Furthermore, our Granger causality tests imply that investment, JINV, plays a more important role for the Japanese macroeconomy than consumption (in the case of one lag in panel A, JINV significantly affects the next quarter's GDP in Japan).

From the above results, we conclude that the Japanese economy is driven by investment, while the US economy is strongly driven by consumption; thus, the economic structure is clearly different between Japan and the US. Therefore, the difference in the role of consumption produces the difference in the forecast power of the consumption-based ratio, the consumption–wealth ratio, in the two countries.

7.2 Consumption smoothing behavior in Japan and the US

Next, we discuss the difference in consumer behavior in Japan and the US. More specifically, we focus on consumption smoothing behavior in Japan and the US.

To address this issue, we show the time-series trends of conditional volatility of JCONS and UCONS, which are derived via the EGARCH model, in Figure 2. Figure 2 suggests that (1) consumption volatility fluctuates much more drastically in Japan than in the US, and (2) the average level of the consumption volatility is much higher in Japan than in the US.

These results suggest that Japanese investors undertake consumption-smoothing behavior much less than US investors. In famous consumption-based asset pricing models (Lucas (1978), Breeden (1979), amongst others), investors are assumed to attempt to reduce their future consumption risk via consumption smoothing. However, Japanese investors' actual behavior, which is inferable from real data, does not fit this idea or assumption well.

As Table 5 indicates, Japanese consumption lags the business cycle. Hence, taking both this fact and the volatile consumption in Japan in Figure 2 into consideration, we conclude that Japanese investors momentarily consume more (less) after confirming economic expansions (recessions) without considering intertemporal smoothing of their consumption.

Hence, the above interpretation means that Japanese investors do not consume with much consideration for future

economic conditions; thus, a consumption-based ratio, such as the consumption–wealth ratio, does not forecast future stock returns well in Japan.

8. Conclusions

This paper investigated the forecast power of the consumption–wealth ratio for stock returns in Japan. Our careful examination demonstrated very different results from Lettau and Ludvigson (2001a), the first authors to use the consumption–wealth ratio, as follows.

First, the forecast power of the consumption–wealth ratio is very weak in Japan. For the long horizon, it showed some forecast power for excess stock returns in Japan. However, the degree of the forecast power is much weaker than that found in the US by Lettau and Ludvigson (2001a).

Second, in Japan, dividend yields demonstrated much stronger forecast power for excess stock returns than *cay*. When the dividend yield is included with *cay* in the same regression, it almost always dominated the forecast power of *cay*.

Third, again in contrast to the US, the relative risk-free rate showed almost no forecast power for the excess stock returns in Japan. According to Lettau and Ludvigson (2001a), Campbell (1991) and Hodrick (1992), the corresponding relative bill rate showed rather strong forecast power for stock returns in the US.

As mentioned above, in Japan, the consumption–wealth ratio, *cay*, did not show strong return forecast power, as opposed to the evidence from the US.

In addition, we consider in detail the reason why the return predictability of the consumption–wealth ratio is so weak in Japan. This is a worthwhile contribution to the literature because due to this interpretation, our findings provide more convincing and meaningful evidence from Japan.

We also note that recently, even in the US, arguments on return predictability are continuing. Welch and Goyal (2008) and Boudoukh et al. (2008) present the view and evidence that return predictability in the US is not robust; Campbell and Thompson (2008) again provide evidence that supports return predictability of the traditional financial variables in the US; while Lettau and Nieuwerburgh (2008) attempt to reconcile these contrasting views on return predictability in the US.

In general, as our research revealed, the case of stock return prediction in other international markets seems to be very different from that in the US. As our additional analysis in Section 7 illustrated, because the structure of the economy or financial markets and investors' behaviors are different in every country, the relation between the macroeconomy and stock markets should be independently and carefully researched in every country, using each country's data.

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Notes

Note 1. Recently in the US, many other studies also used the consumption–wealth ratio, such as Dammon et al. (2001), Maenhout (2004), McQueen and Vorkink (2004), Peress (2004), Chacko and Viceira (2005), Lettau and Ludvigson (2005), Yao and Zhang (2005), Santos and Veronesi (2006), Lustig and Nieuwerburgh (2008), Campbell and Thompson (2008), Ghattassi (2008), Møller (2008), and Welch and Goyal (2008), among others.

Note 2. As far as the authors know, only Iwaisako and Aono (2007) appear to compute this ratio using Japanese data. However, we compute and analyze this ratio quite independently from their research.

Note 3. For discussions on the relation of aggregate labor income and human capital, see, for example, Campbell (1996) and Jagannathan and Wang (1996).

Note 4. Following Lettau and Ludvigson (2001a), we used the value of $k = 8$ in the estimation.

Note 5. Ludvigson and Steindel (1999) also investigated the relation among consumption, asset wealth, and labor income.

Note 6. Following Lettau and Ludvigson (2001a), we used nondurables consumption in estimating *cay*. For example, Blinder and Deaton (1985) and Gali (1990) assumed that total consumption is a constant multiple of nondurable and services consumption in their analysis.

Note 7. Other studies using dividend yields are, for example, Campbell (1991), Campbell et al. (1997), and Cochrane (1991, 1994, 1997), among others.

Note 8. Other studies, such as Lamont (1998), refer to these ratios as payout ratios.

Note 9. Hamao (1988) used these data as the Japanese risk-free rate to analyze the Japanese stock market, because in Japan there exists no rate corresponding to the US 30-day treasury bill rate.

Note 10. The one-month CD rate is unavailable until around June 1984 in Japan.

Note 11. Campbell (1991) and Hodrick (1992) used the relative treasury bill rate to forecast returns. Lettau and Ludvigson (2001a) computed $RREL_t$ as the 30-day treasury bill rate minus its 12-month backward moving average and they used this 30-day treasury bill rate as the risk-free rate in their analysis. Thus, we compute this rate using our risk-free rate.

Note 12. These variables are used in preceding studies such as Shiller (1984), Campbell and Shiller (1988), and Fama and French (1988, 1989). Control variables here include TRM_t and DEF_t. TRM_t is the term spread, the difference between the 10-year government bond yield (from the Bank of Japan) and the risk-free rate. DEF_t is the yield of the Nikkei Bond Index (long-term) (from Nikkei, Inc.) minus the 10-year government bond yield.

Note 13. Campbell and Shiller (1988) showed that the log dividend–price ratio may be written as $d_t - p_t = E_t \sum_{j=1}^{\infty} \rho_a^j \left(r_{a,t+j} - \Delta d_{t+j} \right)$, where $\rho_a = P/(P+D)$, P is the stock price and D is the dividend.
This 'dynamic dividend growth model' explains the linkage between the dividend–price ratio and expected future asset returns.

Table 1. Summary statistics

	$r_t - r_{f,t}$	$d_t - p_t$	$d_t - e_t$	$RREL_t$	cay_t
Panel A: Correlation matrix					
$r_t - r_{f,t}$	1.000	−0.049	−0.042	−0.124	−0.001
$d_t - p_t$		1.000	−0.179	−0.079	0.483
$d_t - e_t$			1.000	0.012	0.418
$RREL_t$				1.000	−0.032
cay_t					1.000
Panel B: Univariate summary statistics					
Mean	−0.001	−5.265	−0.471	−0.001	3.542
Standard dev.	0.113	0.396	1.243	0.003	0.012
Skewness	−1.261	0.550	2.347	0.896	0.061
Kurtosis	5.788	2.652	8.323	7.646	2.810

Notes: $r_t - r_{f,t}$ is quarterly log excess returns of the Tokyo Stock Exchange First Section; $d_t - p_t$ is the log dividend yield; $d_t - e_t$ is the log dividend payout ratio; $RREL_t$ is the relative risk-free rate; cay_t is the consumption–wealth ratio. The statistics are computed for the largest common span of available data for all the variables. The sample period is the second quarter of 1980 to the third quarter of 2002.

Table 2. Forecasting quarterly stock returns

No		Constant	*lag*	*cay*	$d_t - p_t$	$d_t - e_t$	$RREL_t$	TRM_t	DEF_t	Adj.R^2
Panel A: Real returns; 1980:2−2002:3										
1	Coefficient	0.006	0.011							−0.011
	t statistic	0.467	0.112							
2	Coefficient	−6.183		1.748						0.023
	t statistic	−1.657		1.660						
3	Coefficient	−6.177	0.006	1.746						0.011
	t statistic	−1.637	0.060	1.640						
Panel B: Excess returns; 1980:2−2002:3										
4	Coefficient	−0.001	0.000							−0.011
	t statistic	−0.086	−0.001							
5	Coefficient	−6.429*		1.815*						0.025
	t statistic	−1.681		1.682						
6	Coefficient	−6.435	−0.006	1.817						0.013
	t statistic	−1.657	−0.059	1.659						
Panel C: Additional controls; excess returns; 1980:2−2002:3										
7	Coefficient	0.332**			0.063**					0.039
	t statistic	2.124			2.067					
8	Coefficient	−3.249		0.989	0.048					0.035
	t statistic	−0.754		0.828	1.469					
9	Coefficient	0.329*			0.063*	−0.215				0.027
	t statistic	1.909			1.893	−0.001				
10	Coefficient	−4.875		1.431	0.038	−0.007				0.028
	t statistic	−1.024		1.096	0.931	−0.684				
11	Coefficient	−5.785	−0.020	1.679	0.030	−0.006	−5.045	−0.003	−0.024	−0.009
	t statistic	−1.081	−0.154	1.141	0.746	−0.616	−0.685	−0.191	−0.445	

Notes: The table reports estimates from OLS regressions of stock returns on lagged variables named at the head of each column. All returns are in logs and are constructed by using the returns of the Tokyo Stock Exchange First Section stocks. The regressors are all one-period lag variables and are as follows: *lag* denotes a one-period lag of independent variables; cay_t is the consumption–wealth ratio; $d_t - p_t$ is the log dividend yield; $d_t - e_t$ is the log dividend–payout ratio; $RREL_t$ is the relative risk-free rate; TRM_t is the term spread, the difference between the 10-year government bond yield and the risk-free rate; and DEF_t is the yield of the Nikkei Bond Index (long-term) minus the 10-year government bond yield. All *t* statistics are Newey–West corrected *t* statistic values. Significant coefficients at the five (10) percent level are identified by **(*). Regressions use data from the second quarter of 1980 to the third quarter of 2002.

Table 3. Long-horizon regressions

		Forecast horizon *H*						
No.	Regressors	1	2	3	4	8	12	16
		Panel A: Consumption growth (total consumption)						
1	*cay*	−0.344**	−0.481**	−0.541**	−0.567**	−0.370	0.027	0.661
	t statistic	−3.918	−5.606	−4.221	−3.114	−1.044	0.050	0.986
	Adj.R^2	0.190	0.212	0.160	0.114	0.006	−0.013	0.005
		Panel B: Consumption growth (nondurable consumption)						
2	*cay*	−0.302 **	−0.450**	−0.528**	−0.616**	−0.581**	−0.487	0.123
	t statistic	−4.284	−6.171	−5.871	−5.024	−2.266	−1.381	0.305
	Adj.R^2	0.197	0.270	0.269	0.258	0.093	0.028	−0.012
		Panel C: Excess stock returns						
3	*cay*	1.813*	3.635	5.650 *	8.746 *	14.752 **	18.420**	25.714**
	t statistic	1.681	1.588	1.831	2.380	3.203	2.766	3.154
	Adj.R^2	0.025	0.057	0.095	0.168	0.241	0.252	0.317
4	$d_t - p_t$	0.063**	0.126 **	0.192 **	0.260 **	0.512 **	0.766 **	1.028**
	t statistic	2.065	2.395	2.560	2.791	3.786	5.070	7.139
	Adj.R^2	0.038	0.089	0.142	0.189	0.376	0.557	0.715
5	*cay*	0.989	1.836	2.874	5.332	6.936 *	4.419	3.445
	t statistic	0.828	0.694	0.821	1.320	1.821	1.095	0.729
	$d_t - p_t$	0.048	0.099	0.149 *	0.180 *	0.408 **	0.694 **	0.970**
	t statistic	1.467	1.584	1.711	1.748	2.809	4.502	5.744
	Adj.R^2	0.035	0.091	0.151	0.228	0.409	0.562	0.715
6	$d_t - p_t$	0.063*	0.124 **	0.187**	0.253 **	0.488 **	0.760 **	1.030**
	t statistic	1.890	2.157	2.285	2.487	3.367	4.806	7.451
	$d_t - e_t$	−0.001	−0.004	−0.009	−0.013	−0.045	−0.042	0.070 0.502
	t statistic	−0.074	−0.230	−0.359	−0.485	−1.456	−0.745	0.713
	Adj.R^2	0.027	0.079	0.134	0.183	0.389	0.556	−26.259
7	$RREL_t$	−4.403	−8.080	−10.325	−11.340	−32.355	−26.321	−0.974
	t statistic	−0.849	−0.874	−0.792	−0.795	−1.565	−1.033	0.007
	Adj.R^2	−0.002	0.005	0.006	0.004	0.051	0.016	3.085
8	*cay*	1.438	2.716	4.243	7.524	11.373**	7.226 *	0.620
	t statistic	1.105	0.844	0.972	1.451	2.503	1.683	0.970**
	$d_t - p_t$	0.035	0.073	0.109	0.118	0.278 *	0.627 **	5.848
	t statistic	0.899	0.927	1.001	0.934	1.901	3.892	0.028
	$d_t - e_t$	−0.008	−0.016	−0.027	−0.044	−0.093**	−0.096*	0.201
	t statistic	−0.710	−0.820	−1.070	−1.595	−3.165	−1.679	−14.775
	$RREL_t$	−3.680	−6.612	−8.079	−8.271	−27.257*	−19.945	−0.864
	t statistic	−0.767	−0.818	−0.778	−0.791	−1.780	−1.039	0.714
	Adj.R^2	0.024	0.090	0.159	0.251	0.508	0.582	

Notes: The table reports results from long-horizon regressions of excess returns on lagged variables. *H* denotes the return horizon in quarters. The dependent variable in Panel A is *H*-period total consumption growth $\Delta c_{t+1} + ... + \Delta c_{t+H}$. In Panel B, the dependent variable is *H*-period nondurable consumption growth $\Delta c_{n,t+1} + ... + \Delta c_{n,t+H}$. In Panel C, the dependent variable is the sum of *H* log excess returns on Tokyo Stock Exchange First Section stocks, $r_{t+1} - r_{f,t+1} + ... + r_{t+H} - r_{f,t+H}$. The regressors are the consumption–wealth ratio *cay*, the log dividend yield $d_t - p_t$, the dividend–earnings ratio $d_t - e_t$, the detrended short-term interest rate $RREL_t$, and combinations thereof. For each regression, the table reports OLS estimates of the regressors, Newey–West corrected *t* statistics, and adjusted R^2 values. Significant coefficients at the five (10) percent level are identified by **(*). The sample period is the second quarter of 1980 to the third quarter of 2002.

Table 4. Vector autoregression of excess returns

Dependent variable	Constant	$r_t - r_{f,t}$	$RREL_t$	$d_t - p_t$	$d_t - e_t$	cay_t	Adj. R^2
Panel A: Excluding consumption–wealth ratio							
$r_{t+1} - r_{f,t+1}$	0.318*	0.000	−3.655	0.061*	−0.001		0.011
t statistic	1.931	0.003	−0.766	1.973	−0.082		
$RREL_{t+1}$	−0.006**	−0.001	0.696**	−0.001**	0.000		0.658
t statistic	−2.884	−0.458	12.390	−2.792	0.522		
$d_{t+1} - p_{t+1}$	−0.346**	−0.008	3.569	0.936**	−0.003		0.919
t statistic	−2.147	−0.075	0.764	30.934	−0.292		
$d_{t+1} - e_{t+1}$	0.238	0.575	−3.005	0.040	0.946**		0.775
t statistic	0.276	1.020	−0.120	0.250	17.236		
Panel B: Including consumption–wealth ratio							
$r_{t+1} - r_{f,t+1}$	−4.949	−0.010	−3.739	0.035	−0.008	1.448	0.012
t statistic	−0.978	−0.089	−0.784	0.889	−0.620	1.041	
$RREL_{t+1}$	−0.094	−0.001	0.695**	−0.001**	0.000	0.024	0.663
t statistic	−1.594	−0.592	12.455	−3.133	−0.347	1.500	
$d_{t+1} - p_{t+1}$	6.303	0.005	3.431	0.969**	0.006	−1.828	0.920
t statistic	1.278	0.044	0.790	25.091	0.464	−1.348	
$d_{t+1} - e_{t+1}$	−65.576**	0.451	−4.051	−0.282	0.861**	18.093**	0.789
t statistic	−2.549	0.823	−0.167	−1.400	13.756	2.559	
cay_{t+1}	1.814**	0.004	−0.412	0.008**	0.002**	0.500**	0.520
t statistic	4.738	0.524	−1.141	2.711	2.511	4.755	

Notes: The table reports coefficient estimates from vector autregressions (VARs) of log excess returns, relative risk-free rate, dividend-yield, dividend–payout ratio, and the trend deviation term. $r_{t+1} - r_{f,t+1}$ is quarterly log excess returns on Tokyo Stock Exchange First Section stocks; $RREL_t$ is the relative risk-free rate; $d_t - p_t$ is the log dividend yield; $d_t - e_t$ is the log dividend–payout ratio. All *t* statistics are Newey–West corrected *t* statistic values. Significant coefficients at the five (10) percent level are identified by **(*). The sample period is the second quarter of 1980 to the third quarter of 2002.

Table 5. Granger causality tests for real GDP, real consumption, and real investment

Panel A The case of Japan				
The case of lag = 1				
		Result		
Cause	Statistic	JGDP	JCONS	JINV
JGDP	*F* statistic	—	15.009**	1.598
	p value	—	0.000	0.210
JCONS	*F* statistic	2.570	—	0.709
	p value	0.113	—	0.402
JINV	*F* statistic	6.113**	7.220**	—
	p value	0.015	0.009	—
The case of lag = 2				
		Result		
Cause	Statistic	JGDP	JCONS	JINV
JGDP	*F* statistic	—	6.515**	0.645
	p value	—	0.002	0.527
JCONS	*F* statistic	2.008	—	0.225
	p value	0.141	—	0.799
JINV	*F* statistic	2.088	3.293**	—
	p value	0.130	0.042	—
Panel B The case of USA				
The case of lag = 1				
		Result		
Cause	Statistic	UGDP	UCONS	UPDI
UGDP	*F* statistic	—	2.347	19.796**
	p value	—	0.129	0.000
UCONS	*F* statistic	19.881**	—	23.341**
	p value	0.000	—	0.000
UPDI	*F* statistic	1.901	1.158	—
	p value	0.172	0.285	—
The case of lag = 2				
		Result		
Cause	Statistic	UGDP	UCONS	UPDI
UGDP	*F* statistic	—	1.456	8.317**
	p value	—	0.239	0.001
UCONS	*F* statistic	9.873**	—	9.742**
	p value	0.000	—	0.000
UPDI	*F* statistic	2.985*	0.580	—
	p value	0.056	0.562	—

Notes: JGDP denotes the quarterly log growth rate of real GDP in Japan; JCONS denotes the quarterly log growth rate of real consumption (nondurables and services) in Japan; JINV denotes the quarterly log growth rate of real gross domestic investment in Japan; UGDP denotes the quarterly log growth rate of real GDP in the US; UCONS denotes the quarterly log growth rate of real consumption (nondurables and services) in the US; and UPDI denotes the quarterly log growth rate of real gross private domestic investment in the US. The null hypothesis is that 'Cause' variables do not Granger cause the 'Result' variables. Significant *F* statistics that statistically reject the null hypothesis at the five (10) percent level are identified by **(*). The sample period is the second quarter of 1980 to the third quarter of 2002.

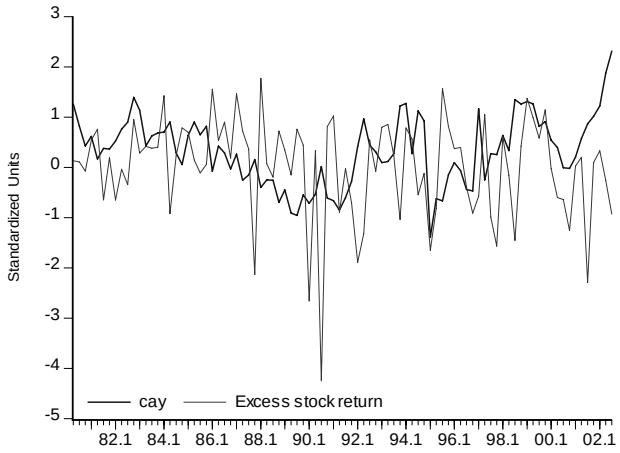

Figure 1. Excess Stock Returns and the Trend Deviations, *cay*, in Japan

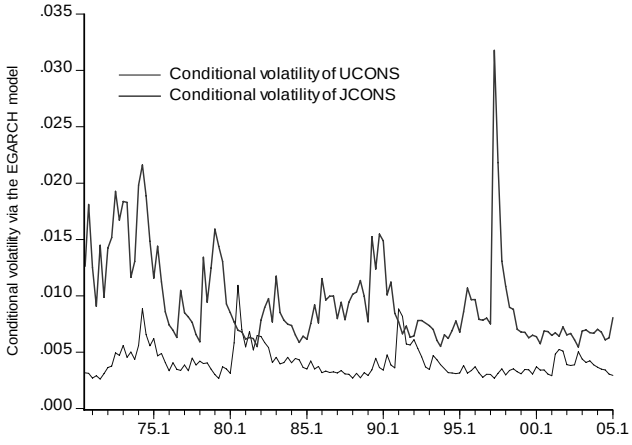

Figure 2. Conditional Volatility of Consumption in the US and Japan

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Assessing Economic Connectedness Degree of the Malaysian Economy: Input-Output Model Approach

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Abstract
Economic connectedness can be defined as the degree of internal connectedness of interdependence between the sectors of an economy. In input-output models intersectoral connectedness is a crucial feature of analysis, and there are many different methods of measuring it. These measures are believed to be important structural indicators, helpful in model estimation. Also, such measures could be analytical useful, along with the input-output models themselves, as descriptions of the nature of the modeled economies, as aids in model estimation, and perhaps as indication of the level of economic development. However, they allow for a summary description and comparative analysis of various linear flow systems. Most of the measures, however, have important drawbacks to be used as a good indicator of economic connectedness, because they were not explicitly made with this purpose in mind. In this paper, I present, discuss, compare and interpretation empirically different indexes of economic connectedness as sectoral connectedness, using a set of four empirical models for the Malaysian economy. The results suggest that mean intermediate coefficient total per sector, % intermediate transaction and % nonzero coefficients are the most generally useful interconnectedness measures for Malaysian Economy.
Keywords: Input-output Model, Intersectoral, Connectedness, Interrelatedness, diversification.

1. Introduction:

Structural analysis is concerned with the qualitative properties of input-output tables, especially the properties of the technical input-output matrix. From the technical matrix of an economy we can see the extent of technical interdependence among sectors. Moreover, by comparing different tables covering different time periods, we can find whether inter-industrial dependence has been intensified or not. So it should mention here the following. If transactions are spread all over the matrix, interdependence is high and the interaction effect large. If transactions are bunched, then interdependence is low and localized, leading to a better approach by partial models of input-output, or otherwise, rather than by general input-output models (GHOSH and SARKAR, 1970; p. 136).

The researcher shall discuss techniques for analyzing the productive structure of the Malaysian economy. In an input-output table, where the position of each industry is arbitrarily assigned, we see figure of different magnitude, including blanks, scattered all over the table. In an economy, however, not every industry is related to all other industries, while some do business only with a few other industries. In other words, changes in some industries will yield greater repercussion effect than change in other. From the multiplier analysis of the economy, it is necessary to give attention to those industries which are likely to extent an important influence on the economy, so that approach measures may be taken in advance to divert undesirable economic fluctuations.

From the technical input-output matrix we can see the direct connection of each industry with the others. However, to decide how important an industry is an economy, it is not enough that we look only at the number of industries directly connected with this industry. An industry may directly sell to or buy from only a few industries, but its customers and suppliers may be connected with a good many other industries. This industry may thus have a profound influence on the economy through its indirect relations with other industries. Therefore, it is essential that we consider all direct and indirect relations of each industry with other industries when we try to decide how important it is. These methods can be associated with any input-output table for defining interrelatedness functions which have economic interpretations. Interrelatedness is also associated with diversification in a simple way, as we will discuss latter. It is empirically possible to examine the way in which interrelatedness has changed over time, and to make predictions about hypotheses such as technological convergence, which have so far been difficult to subject to empirical analysis (YAN and AMES, 1965; p.299). Thus an interrelatedness function would be a useful measure in a number of economic contexts.

The study of economic connectedness in an input-output framework has been an interesting subject for economic analysis and policy making purposes (see e.g., ROBINSON and MARKANDYA 1973, SONIS et al 1998 and DRIDI and HEWINGS 2002). For example, in a more complex economy the effects of (global) policy measures tend to be easily and rapidly propagated and more evenly distributed among sectors, and the same goes for unexpected (desirable or undesirable) shocks of any nature (see, eg., SONIS et al 1995, DIETZENBACHER and LOS 2002, STEINBACK

2004 and OKUYAMA 2007).

The subsequent six sections of this paper are structured as follows. Section 2 discusses the problem and objectives of this paper. Section 3 discusses the theory and literature reviews of measuring interrelatedness. Section 4 deals with the application of these methods to the Malaysian economy. Section 5 examines performance of these measures. Section 5 shows some policy implications. Section 6 presents some conclusions and further studies.

2. The problem and Objectives:

During the past three decades, the Malaysian planners have implemented a series of planning horizon, ranging from short to long-term development plans. Subsequently, updated and adequate data would be required for monitoring the progress and performance towards achieving the planned targets.

The planners aim for the period 1998-2010 sets strategic directions for economic development to the year 2010. This policy has been formulated to ensure that the integration role in national development is sustained and enhanced in the light of new and emerging challenges facing economic development.

Towards this end, the planners will focus on new approaches to increase productivity and competitiveness, deepen linkages with other sectors, venture into new frontier areas as well as conserve and utilize natural resources on a sustainable basis. The policy aims to set in place the enabling and supportive measures as well as a conducive environment to promote growth in the economy. The policies and strategies formulated will continue to emphasise productivity and market driven growth (Ministry of Agriculture and Agro-Based Industry, 2006).

An approach employed by policy makers to project, plan and make decision on national development programs is to use an input-output model. Input-Output analysis has become an increasingly popular means for analyzing economic structures and assisting local economic development decision making. Input-output models provide a variety of useful information. It is a descriptive tool which describes the existing structure of a economy; it provides information on individual economic sectors, the linkages between them and how they co-vary. It also shows the relative importance of individual sectors conditions. Input-Output analyses describe the economic transactions pertaining to the economic activity that occurred within specified reference periods.

In Malaysia, as in most natural resources developing countries, the availability of foreign exchange generated by the rapidly growing export of oil and gas, rubber and Palm oil has been of great importance to the process of economic development. The aim of Malaysia development policy has been, primarily, to invest in the commodities sectors. The rational behind this policy was to build a solid base for the Malaysia economy, by using the oil and gas, rubber and Palm oil revenues to support the establishment of large scale enterprises, which could produce intermediate products at competitive prices for the other industries in the economy; this would thus aid the integration of the national economy. Secondary aims were to assist in income redistribution, import substitution, export growth and agricultural modernization.

Unfortunately, such a policy of inter-sectoral imbalance between economic sectors has lead to a poorly integrated economy in the short-run, causing a heavy dependence on imports. The presently existing weak forward and backward linkages between sectors are cited among the problems existing in the Malaysian economy.

In addition, the planners' policy towards the industrial sector regarding the adoption of advanced technology resulted in production below its potential maximum in the short-run. This is because a number of structural "bottlenecks" developed, such as an insufficiently trained labour force and a lack of managerial and technical skills, as well as a heavily bureaucratic and hierarchical structure of organization.

This paper aims to assess the success or failure of Malaysian economic policy with input-output analysis. A static input-output model is used. Unfortunately, dynamic input-output models must be ignored, as the necessary capital matrix is not available for the Malaysian economy. The period of study is 1983 to 2000, during which time four input-output tables were established.

It would be expected that in resources-rich developing economy, such that of Malaysia, substantial structural change will take place over time. In particular, one might expect marked changes in the technologies employed, especially the nature of inter-industry trading. Also, change in the level and mix of final demand for produced goods would be expected to occur. One would anticipate that the role of state economic planning would be to facilitate and direct such developments.

Input-output analysis is well suited to the analysis of the nature of economic development through changing demand and changing technology. Thus this paper uses input-output methods to explore the success of economic planning in Malaysia. A variety of input-output techniques and concepts are employed. All lead towards the conclusion that economic integration has occurred in Malaysia during the period of study. Also, there is evidence of increasing efficiency in the Malaysian economy.

3. Theory and Literature Review:

There is wide range of possible measures of interrelatedness using input-output analysis. Most of these measures were proposed by authors in economics but there are some proposed by biologists, and have an ecological content (useful surveys of some of these measures are HAMILTON and JENSEN 1983, SZYRMER 1985, BASU and JOHNSON 1996,

CAI and LEUNG 2004, and AMARAL et al 2007 and 2008). It used the measures proposed by economist for Malaysian economic analysis. These methods are listed with notation and range for these methods in Table 1.

Insert Table 1 Here

This paper shall concentrate on the Yan and Ames measure, as the most interesting interrelatedness method. However, it also relies on triangularisation method of ordering input-output tables.

3.1 Percentage Intermediate Transaction Method

One of the most obvious potential measures of interconnection is the percentage of the total production of industries in the economy which is used to satisfy needs for intermediate input. This measure was suggested by CHENERY and WATANABE (1958, p.492). For an input-output model this percentage can be mathematically expressed as:

$$I^{pit} = \frac{\underline{i}'\underline{\underline{Z}}\underline{i}}{\underline{x}\underline{i}} * 100 \quad (1)$$

Here, $\underline{\underline{Z}}$ is the transactions, or direct transactions matrix, $\underline{x}$ is the total output vector, and $\underline{i}$ is the unit (summation) vector. Those sales where the output of one sector satisfies the input demands of other sectors are the link which ties together the economy. Obviously, when a large fraction of input-output transactions are intermediate transactions, one can expect that the model under consideration is relatively well interconnected. The I^{pit} index, however, is insensitive to the diversity of these intermediate connections. For instance, one can imagine a model with only one huge transfer, while all other entries in the $\underline{\underline{Z}}$ matrix are zero. According to this index, such a model can be well interconnected, but this result is hard to accept (SZYRMER, 1985; p.1594). The result for the Malaysian economy is shown in Table 3, row 1.

3.2 Average Output Multipliers Method

This is perhaps the most simple of the measures of interconnection. This measure was suggested by HAMILTON and JENSEN (1983; p.56) as a relatively good descriptor of interconnectedness. It is calculated as the arithmetical average of the sums of the columns of the Leontief inverse. The sector multipliers measure interconnectedness of each sector, whereas the average multiplier is an overall measure of interconnection of the economy. It can write this mathematically as:

$$I^{aom} = \frac{1}{n}\underline{i}'(\underline{\underline{I}}-\underline{\underline{A}})^{-1}\underline{i} \quad (2)$$

Here, n is the number of sectors in the input-output model. Notice that multipliers might be called technical measures of interconnectedness; they depend only on the direct or technical coefficients in the $\underline{\underline{A}}$ matrix and are entirely independent of the actual sector importance, as measured by $\underline{x}$.

HAMILTON and JENSEN argue that greater interconnection means greater and more intensive impacts on particular sectors. By impacts, however, they presumably mean the effects of changes in final demands, which, by the nature of things, occur outside the system. Therefore, a greater output multiplier means stronger links between the external demand and the internal production, which is not automatically identical to intensive interconnections inside the model (SZYRMER, 1985; p. 1595). Thus the direct and indirect impact of a change in final demand for the output of industry j is the sum of the changed output levels in all n industries. Intuitively, the greater the interconnection, the greater and more widely spread will be the impacts on the various sectors.

An analogous measure of interrelatedness is proposed by BLIN and MURPHY (1974), namely, the average cell of the Leontief inverse, which is obviously identical to the average output multiplier divided by the number of sectors: I^{aom}/n. BLIN and MURPHY even claim the Leontief inverse expresses the total amount of input dependence of sector j on the output of sector i (BLIN and MURPHY, 1974; p. 438).

In contrast, percentage intermediate transactions might be called a specific measure, since it refers to a specific economy and depends on the relative importance of various industries, indicated by $\underline{x}$. The results of this measure for Malaysian economy input-output tables of 1983, 1987, 1991 and 2000, are given in Table 3, row 2.

3.3 Percentage Non-Zero Coefficients Method

This measure of interconnectedness was used by PEACOCK and DOSSER (1957; pp.21-24). It can be expressed mathematically as:

$$I^{pnc} = \frac{100 * \underline{i}'\underline{\underline{K}}\underline{i}}{n^2} \quad (3)$$

Here, $\underline{\underline{K}}$ is a matrix of the same dimension as the, $\underline{\underline{A}}$, matrix and it can define this matrix by following:

$$K_{ij} = \begin{cases} 1, \text{if } a_{ij} \neq 0 \\ 0, \text{otherwise} \end{cases}$$

Since the multipliers, computed from the inverse matrix, seem intuitively to be related to economic interconnection, it seems reasonable to search for some summary statistic assessing the nature of the $\underline{\underline{A}}$ matrix itself as a measure of interconnectedness. The intermediate coefficients are the links of interconnections, and more links suggest greater interconnection. Thus the percentage of the intermediate coefficients which are non-zero is one crude measure of interconnectedness (HAMILTON and JENSEN, 1983; p.57).

In the case of more highly interconnected models, the coefficients matrix, $\underline{\underline{A}}$, is likely to have fewer zero entries. The

result of this measure for interdependence of the Malaysian economy, for these input-output tables, is shown in Table 3, row 3.

The percentage non-zero coefficients is known in the ecological literature as direct connectivity, or conncetance, and is applied by many authors (GARDNER and ASHBY, 1970). It takes into account neither the specific position of the non-zero coefficients in the table, nor their magnitudes.

3.4 Coefficient Sum and Means Method

This measure calculates the mean intermediate coefficient total per sector, which shares most of the deficiencies of the percentage of non-zero coefficients. The measure uses not only the number of non-zero coefficients, but also the size of the coefficients in $\underline{A}$ as indicators of the degree of interconnection. It can be formulated mathematically as:

$$I^{mitps} = \frac{\underline{i}'\underline{A}\underline{i}}{n} \tag{4}$$

Here, n is the number of intermediate sectors. This method was used by BURFORD and KATZ (1977; pp.21-38). They showed that the output multipliers were primarily determined by the column sums of the $\underline{A}$ matrix. JENSEN and WEST (1980) and HAMILTON (1979) also used the sum of the intermediate sector coefficients to compute a summary measure of model interconnectedness. Since the sum itself would be strongly related to the level of aggregation of the model, the sum was divided by the number of sectors to give mean intermediate coefficient total per sector. Notice that I^{mitps} is a technical measure of interconnection, being independent of $\underline{x}$. It deals only with direct relationship in an input-output model and ignores the specific positions of the input coefficients, but, unlike the index of the percentage of nonzero coefficients, it takes into account the magnitudes of the a_{ij} rather than just the number of non-zero coefficients. The results for this measure for the Malaysian economy are shown in Table 3, row 5.

3.5 Determinant Method

One of the more important mathematical characteristics of a matrix is its determinant. The determinant of the Leontief system $|\underline{I}-\underline{A}|$, was originally suggested as a measure of connectedness by WONG (1954; pp.283-341). Since, as is known from matrix algebra, the inverse of a matrix equals the adjoint divided by its determinant, one can expect that the smaller the denominator in this formula, the larger the elements of the inverse (HEAL, HUGHES and TARLING, 1974; p.87).

It might expect that smaller determinants would be associated with inverse matrices having larger elements, with larger multipliers, and with a greater degree of interconnectedness (HAMILTON and JENSEN, 1983; p.58). Since the determinant depends only on the direct coefficients, it is also a technical measure. However, the Leontief inverse per sector is not a perfect measure of interconnectedness. Moreover, the formula for $(\underline{I}-\underline{A})^{-1}$ should warn one of the fact that the elements of the Leontief inverse depend not only upon the value of the determinant, but also on the magnitudes of the respective adjoint matrix (SZYRMER, 1985; p.1596). Therefore, a low determinant does not automatically imply large entries in the Leontief inverse. The results for this measure for the Malaysian economy are shown in Table 3, row 6.

3.6 YAN and AMES Method

This method was initially suggested by YAN and AMES (1965; pp.299-310). The authors suggest the areas of potential application of their method may include inter-industrial diversity and specialization, technological change in the economy, and others (SZYRMER, 1985; p.1596).

3.6.1 YAN and AMES Matrix

For purposes of illustration of this method, consider an example as given by YAN (1969; pp.94-96). The author introduces a simple 4x4 technical coefficient matrix, $\underline{A}$, with three nonzero entries. To make this method simple to use, it will show the expansion series of the Leontief model for the matrix suggested by YAN and AMES. It shows the ordering of the sector that has connections with others in each round. It defines this matrix, $\underline{Y}$, with elements, y_{ij}. $\underline{Y}$ has the same number of rows and columns as $\underline{A}$. It is associated with each technical coefficient, $\underline{A}$, having non-negative elements. As the YAN and AMES method is an iterative method, the round of iteration is indicated by appropriate supscript, $\underline{A}^2$, $\underline{A}^3$, etc. Assume that each of these entries is 0.4:

First Iteration:

$$\underline{A} = \begin{bmatrix} 0 & 0.4 & 0 & 0 \\ 0 & 0 & 0.4 & 0 \\ 0 & 0 & 0 & 0.4 \\ 0 & 0 & 0 & 0 \end{bmatrix} \qquad \underline{Y}_1 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \tag{5}$$

The next term, $\underline{A}^2$, shows the first-round indirect inputs required to produce the direct input $\underline{A}$. By performing the standard matrix multiplication, one can obtain the second-round matrix. This can be illustrated as follows:

Second Iteration:

$$\underline{A}^2 = \underline{A}*\underline{A} = \begin{bmatrix} 0 & 0 & 0.16 & 0 \\ 0 & 0 & 0 & 0.16 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \qquad \underline{Y}_2 = \begin{bmatrix} 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \tag{6}$$

The third term, $\underline{A}^3$, indicates the inputs required to produce the second-round indirect inputs, for:
Third Iteration:

$$\underline{A}^3 = \underline{A}*\underline{A}^2 = \begin{bmatrix} 0 & 0 & 0 & 0.064 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \qquad \underline{Y}_3 = \begin{bmatrix} 0 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \tag{7}$$

Fourth Iteration:

$$\underline{A}^4 = \underline{A}*\underline{A}^3 = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \qquad \underline{Y}_4 = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \tag{8}$$

This iteration has to be repeated until all higher-round matrices, are null. One can combine all the matrices, defined above as $\underline{Y}_1$, $\underline{Y}_2$, $\underline{Y}_3$, and $\underline{Y}_4$, in the following way:

$$Y_{ij}^{YA} = \min\{Y_{1ij}, Y_{2ij}, \ldots, Y_{kij}\} \tag{9}$$

For $Y_{kij} \neq 0$, for all K_{ij}, i.e., $\underline{Y}$ contains the smallest non-zero elements in the Y_k matrices. The result for the order matrix of the example above is as follows:

$$\underline{Y}^{YA} = \begin{bmatrix} 0 & 1 & 2 & 3 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \tag{10}$$

Following the notation of YAN and AMES, we substitute ∞ for zero elements in this matrix. Then the matrix appears as follows:

$$\underline{Y}^{YA} = \begin{bmatrix} \infty & 1 & 2 & 3 \\ \infty & \infty & 1 & 2 \\ \infty & \infty & \infty & 1 \\ \infty & \infty & \infty & \infty \end{bmatrix} \tag{11}$$

YAN and AMES have suggested a general form of this matrix, $\underline{Y}^{YA}$. They set $y_{ij} = k_{ij}$ instead of the numbers in the form (11), as follows:

$$\underline{Y}^{YA} = \begin{bmatrix} \infty & k_1 & k_2 & k_3 \\ \infty & \infty & k_1 & k_2 \\ \infty & \infty & \infty & k_1 \\ \infty & \infty & \infty & \infty \end{bmatrix} \tag{12}$$

Where, $1/\infty = 0$ and k = 1, 2, …, n. Then, the order matrix, $\underline{Y}^{YA}$, attributed to the $\underline{A}$ matrix appears as shown above. Each entry, Y_{ij}^{YA}, in the order matrix, $\underline{Y}^{YA}$, represents the smallest order of relatedness between i and j. That is, it is equal to the number of input-output rounds which are needed for the first i-j connection to occur. Obviously, there are precisely three connections for first order, two of second, and one of the third, which are appropriately recorded by the order matrix, $\underline{Y}^{YA}$.

3.6.2 YAN and AMES Interrelatedness Function

$\underline{Y}^{YA}$ can be used to define an interrelatedness function. This measure considers only the existence of input-output relations between industries and disregards the magnitude of transactions; it indicates the relatedness (both direct and indirect) of industries. This measure is a technical measure also, since it does not rely on $\underline{x}$.

Next, we define an interrelatedness function. This function, in its most aggregate version, is expressed by a single number, the interrelatedness index, I^{YA}. Then, the interrelatedness function can be computed mathematically from Y^{YA}, for each row, as,

$$I_i^{YA} = \frac{1}{n}\sum_{j=1}^{n}\frac{1}{y_{ij}} \tag{13}$$

This expresses the sensitivity of a given sector to changes in the other sectors. Alternatively, it can calculate,

$$I_j^{YA} = \frac{1}{n}\sum_{i=1}^{n}\frac{1}{y_{ij}} \quad (14)$$

This expresses the sensitivity of all other sectors to impacts on a given sector. The overall measure of interconnection of the economy is computed as the average of the reciprocals of entries of the $\underline{Y}^{YA}$ matrix:

$$I^{YA} = \frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n}\frac{1}{y_{ij}} \quad (15)$$

In particular, if i=j=1, then $I^{Ya} = \frac{1}{y_{ij}}$. In the example show above, I^{YA} = 0.27. The results for the Malaysian economy are shown in Table 3, row 7.

It will be noted that the YAN and AMES interrelatedness function is the reciprocal of the harmonic mean of the elements of the appropriate sub-matrix of $\underline{Y}$ (YAN and AMES, 1965; p.300). The value of I^{YA} is thus uniquely defined for any sub-matrix of $\underline{Y}$, and hence for any matrix $\underline{A}$ with non-negative elements. Observe that $0 \leq I^{YA} \leq 1$; I^{YA} =1 if the corresponding elements of $\underline{A}$ are strictly positive, and I^{YA} =0 if all the corresponding elements of $\underline{Y}$ are infinite. The matrix $\underline{Y}$ and the function I^{YA} depend not only on the number, but also the location of the non-zero elements of $\underline{A}$. This is the main reason, as it mentioned earlier in this paper; the interrelatedness function relies on the triangularisation technique.

One further observation about the interrelatedness function is needed. If (n_1, n_2, …, n_n) denote the number of elements of a sub-matrix of the order matrix whose values are equal to (1, 2, …, n), then the interrelatedness function may be rewritten:

$$I^{YA} = \frac{1}{n^2}\sum_{k=1}^{\infty}\frac{n_k}{k} \quad (16)$$

In particular, we may isolate the first term in this series, so that:

$$I^{YA} = \frac{n_1}{n^2} + \sum_{k\neq 1}^{n}\frac{n_k}{k\,n^2} \quad (17)$$

The first right-hand term measures the proportion of elements of the order sub-matrix which are equal to 1; that is, the proportion of the elements of the sub-matrix of $\underline{A}$ which are non-zero. This term will be referred to as the index of diversification, and the second term will be referred to as the index of indirect relatedness (YAN and AMES, 1965; p.300). The concept of diversification has economic content if the sub-matrix in question is (1xn) or (nx1) or (nxn). In the fist case, the term n_1/n represents the proportion of industries to which a given industry sells; in the second case, it represents the proportion of industries from which a given industry buys, in the third case, n_1/n^2 represents the proportion of the mathematically possible kinds of direct relations which are actually realised.

The index of diversification for the Malaysian economy has been calculated and is shown in Table 5. The interpretation will be discussed later in this paper (see Section 4).

Diversification is taken to be opposite of specialization, in which an industry has few customers, or suppliers, and an economy is characterised mainly by indirect relations.

4. Interpretation of Empirical Results:

The aim of this section is to apply the methods and techniques as described in the previous section. The four input-output tables for the Malaysian economy are identified in Table 2 with some important characteristics of the input-output tables.

These characteristic refer to:

The order of the respective matrices in terms of sectors (row 1) and intermediate cells (row 2).

The total value of the transactions recorded in the intermediate quadrant (row 4).

Also, Table 2 shows some measures of the degree of interconnectedness, or the strength of intersectoral linkages, in each matrix. These measures include:

The percentage of cells initially with a value of zero (row 3).

The total of all coefficients in the intermediate quadrant (row 5).

The mean coefficient total per sector of the intermediate quadrant (row 6).

The last of these, effectively measured as the sum of the a_{ij} of the intermediate quadrant divided by the number of sectors, was accepted as an interim measure of interconnectedness in the national economy. It will be noticed that this measure of interconnectedness has some positive correlation with the total of the intermediate coefficients (row 5), and the total of the intermediate transactions (row 4). Also, this measure has an inverse correlation with the percentage of zero cells in the initial table (row 3).

These six measures of economic interconnectedness were applied to the four input-output tables of the Malaysian economy. The results are shown in Table 3.

Table 3 reveals the following:
According to the percentage intermediate transaction measure, and coefficient sum and means index, it seems that the Malaysian economy was rapidly changing in the period 1980-2000. This follows from the interconnections in the Malaysian economy increasing over time during that period.
As it see from the results measured by average output multipliers, the interrelatedness of the Malaysian economy in 1983 was similar to that for 1987 and 1991.
The interrelatedness is similar for the tables for 1983 and 1987, and for 1991 and 2000 as measured by percentage non-zero coefficients.
If it considers the interrelatedness as measured by I^{YA}, there is some increase for Malaysia Economy for the period 1980-2000.
The determinants method suggests that the change in the Malaysian economy is high for the period under study. It could be interpreted that developments in the Malaysian economy was very high over the period 1980-2000. However, this measure has positive correlation with average output multipliers.
It has examined the sequence $a_{ij}, a_{ij}^2, a_{ij}^3, ..., a_{ij}^n$ for the Malaysian economy by the same procedure as in the example, in the previous section (3.6.1). Equation (17) has been applied to the tables as mentioned above. The results are shown in Table 3, row 8.
It can be seen at a glance from $\underline{K}$ matrices as it identified in section 3.3, which industries are connected with all sectors and which industries have few interrelations, such as these sectors are shown in the table (4).
From Table 3 it is rather difficult to get much feel for the effectiveness of the various measures. Most of them behave quite systematically, the most obvious exceptions being the erratic performance of several measures when applied to the national table for 2000.
It may now consider the empirical connections between diversification and interrelatedness. This connection may be viewed either in term of the economy as a whole, or of particular industries. Here the researcher considers the whole economy rather than individual sectors. Table 5 gives a frequency distribution of the element of the 1983, 1987, 1991 and 2000 technological order matrices, and the values of the interrelatedness function and diversification Index for these matrices.
Table 5 shows that the increase in interrelatedness was by (0.007) in the period of study. Nevertheless the diversification was decreased by (-0.02). That is, it is not exceeded the increase in interrelatedness, because there was a small decrease in indirect relatedness in the economy.

5. Performance of the Interconnectedness Measures:

When judging the performance of these six measures of interconnectedness, it is important to realize that there is no objective standard against which to compare their effectiveness. There is no recognised perfect measure in the input-output literature. Hence, any judgment must be based on the underlying logic of the measure itself, and on any inconsistencies or ambiguities that result when the measures are used.
Of the six interconnectedness measures evaluated in this paper, five were technical measures based only on the coefficients in the matrix $\underline{A}$. The only specific measure incorporating information on sectoral output level, $\underline{x}$, is the percentage intermediate transaction. It is hardly surprising to find that such a measure behaves erratically when compared with any of the five technical interconnectedness measures. Percentage intermediate transactions in such a situation can show a high degree of interconnection, even though most of the sectors in the economy are in fact only slightly interconnected, as is clearly the case in the Malaysian economy in 2000; while the degree of interconnectedness is 30.3, the percentage of cells initially zero is 6.68%.
In contrast, if a national economy has a large enclave industry, which exports most of its output, and relies mostly on imported inputs, then percentage intermediate transactions will detect this condition better than the technical measures, because it is the only measure which incorporates information about sector size. The only measure insensitive to aggregation is percentage intermediate transactions, which is probably best relegated to instances of extreme sector size imbalance (HAMILTON and JENSEN, 1983; p.65).
The implication, of course, is that when comparing the interconnectedness of economies by means of one of these five measures, the measures should be based on table with a common level of aggregation. In the ideal situation, where accounting system and model size are both constant, and where the sector sizes are not extremely imbalanced, the choice of an ideal measure is clear. Average output multipliers have the virtue of a strong underlying theoretical logic. Yet in such circumstances there is an almost one-to-one corresponding between mean intermediate coefficient total, average output multiplier, and determinant, suggesting that these measures are all equally good. If that is true, then the choice for an operational measure of interconnectedness goes to the measure that is easiest to compute, which is mean intermediate coefficient total per sector.

6. Policy Implications:

Malaysia has long involved in the economy spheres with evolution in its economics transitions from agricultural-based, production-based, services-based, and now the most talk about knowledge-based economy. With Malaysia nearly

reaching to its half-century life span at 47 year-old, nevertheless the country's economic performance thus far have seen broad-based growth even with some hitches in the economic arena regardless of global or local platforms. In spite of the continuing uncertainties and underlying structural weaknesses, Malaysia has overhauled and further enhanced the resilience of the Malaysian economy with greater balance between domestic and external sources of growth, between the role of the private and public sectors, among the performance of various sectors in the economy (CHING, 2006).

Over the years, Malaysia economy has seen tremendous transformation across all segments of the economy. While the Malaysian economy was affected by the unavoidable external developments in the global phenomena, it has to a certain extent successfully focus its policies and economic development activities in directing the nation towards sustaining domestic demand and promoting domestic sources of growth. With that in mind, it has effectively contributed towards the well-balanced growth for Malaysia to surf on the evolving wave in realizing the Vision 2020 as the national long-term goal.

The aims and the theoretical basis of Malaysian economy planning were discussed early in this paper, especially since 1970. To briefly summarise, interrelatedness is a concept in economic development models which has emerged to investigate the relationship between sectors. Now Malaysian development planning policies have tried to place the emphasis on electronic industry, in which Malaysia has a comparative and absolute advantage, as a base for future industrialization. This type of industry, however, depends almost entirely on industry product as its raw material. This therefore implies the need for a long-term conservation objective, while at the same time strengthening the linkages between this sector and the rest of the economy.

The development planning in Malaysia was aimed at creating an interrelationship between the sectors, bringing the benefits; it was hoped, of indirect gains of external economies and the transfer of technology and know-how. These processes are thought to have been the utmost importance for the development process, promoting backward and forward linkages throughout the domestic economy.

The planners have allocated the large investment made in the Malaysian economy since 1970, and these have increased in size over time (CHING, 2006). In view of this high level of investment, the degree of interconnectedness in the Malaysian economy would be expected to produce a high interrelatedness function.

The results shown in Table 2, 3, 4, and 5, and discussed in the previous sections, show how far this policy has been successful. The tables show that some progress has been made, but it falls far short of what the planners aimed to achieve. As it has seen in Table 4, the crude oil sector still has negligible interrelations with economy. So, we can conclude that the intersectoral between sectors, as it can be seen in the Tables (2,3, and 5), still remains weak.

However, the planning policy for the future development of the Malaysian economy was purposely designed around a clear picture of the integration process among the various economic sectors. It aimed at channeling the output of the Agriculture sector away from exports and into the domestic manufacturing sectors, especially, rubber and Palm oil. The policy also put more emphasis on the manufacturing industries which depended on domestic raw materials (CHING, 2006).

This policy of integration has also focused on the agricultural sector, because agriculture is still the backbone of development in every LDC, particularly Malaysia which is rich in agricultural resources (ISMAIL, 2006).

7. Conclusions and Further Studies:

According to the results shown previously, it can be said that there has been little increase in the interrelatedness among the sectors in the Malaysian economy. In this paper we have explored some of the input-output techniques to measure the success of connectedness in the Malaysian economy.

The interrelatedness between sectors, as measured by connectedness methods, was still very weak; because the commodities sectors have failed to play a leading role in accelerating economic development. They did not become a growth pole for the diffusion of technical progress.

However, this sort of analysis needs to consider a more fundamental set of objectives than interrelatedness of input-output relationships. Investment is not usually considered as an objective, but as proxy for an increasing efficiency of the economy. However, if we consider increasing efficiency over time as our objective, then each investment needs to be evaluated in terms of its direct and indirect effect. This can be done by reference to the Linkages and Multipliers techniques using input-output methods which could be discussed for further papers. Also, the results of this empirical research need to be carefully examined and we plan to do in the immediate future.

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Table 1. List of Measures

Measure	Notation	Range
Percentage of Intermediate Transaction.	I^{pit}	(0, 100)
Average Output Multipliers.	I^{aom}	(1, ∞)
Percentage of nonzero Coefficients.	I^{pnc}	(0, 100)
Coefficient Sum and Means Method.	I^{mitps}	(0, 1)
Determinant of (I-A).	I^{det}	(0, ∞)
YAN and AMES Index.	I^{YA}	(0, 1)
Diversification Index.	I^{der}	(0, 1)

Table 2. Identification and Characteristics of input-output Tables for Malaysian Economy.

Measure	Input-Output Tables			
	1983	1987	1991	2000
Intermediate sectors	60	60	92	92
Intermediate cells	3600	3600	8464	8464
Cells initially zero	171	155	515	565
Total intermediate transaction	45,264,180	50,565,283	102,330,738	271,699,945
5. Total intermediate coefficients	21.11	21.00	32.693	34.305
6. Mean coefficient total per sector	0.352	0.354	0.355	0.373

Source: Malaysian Input-Output Tables for 1983, 1987, 1991 and 2000.

Table 3. Measures of Interconnectedness for Input-Output Tables or Malaysian Economy

Measure	Input-Output Tables			
	1983	1987	1991	2000
1. % intermediate transaction	18.8	17.7	19.3	30.30
2. Average output multipliers	1.53	1.53	1.54	1.58
3. % nonzero coefficients	95.3	95.6	93.9	93.37
4. % of cells initially zero	4.75	4.33	6.08	6.68
5. Mean Intermediate Coefficient sum	0.352	0.354	0.355	0.373
6. Determinant of (I-A)	0.064	0.071	0.012	0.003
7. Yan and Ames	0.956	0.973	0.964	0.963

Source: Malaysian Input-Output Tables for 1983, 1987, 1991 and 2000.

Table 4. Sectors have few interrelations

	Input-Output Table			
	1983	1987	1991	2000
1	Livestock	Livestock	Livestock	Coconut
2	Foresting	Foresting	Fishing	Tea Estate
3	Fishing	Fishing	Crude oil	Fishing
4	Private non-profit services	Private non-profit services	Ownership dwelling	Ownership dwelling

Source: Malaysian Input-Output Tables, 1983, 1987, 1991 and 2000, Department of Statistics, Malaysia.

Table 5. Technological Interrelatedness in the Malaysian Economy

Order of Interrelatedness	Number of Elements of Technological Order Matrix			
	1983	1987	1991	2000
1	3429	3445	7949	7899
2	111	95	239	382
3	60	60	276	183
∞	0	0	0	0
Total	3600	3600	8464	8464
I^{YA}	0.956	0.973	0.964	0.963
I^{der}	0.953	0.957	0.939	0.933

Source: Malaysian Input-Output Tables, 1983, 1987, 1991 and 2000, Department of Statistics, Malaysia.

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How to be Competitive in Chinese Automobile Industry

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Abstract

Chinese market has a great demand for foreign cars, and a great many foreign automobile companies are competing for their market shares here. The most representative ones are Volkswagen and Honda, they adoped different market strategies and they both suffered some success and failures With so many competitions, the future of Chinese automobile industry is hard to predict.

Keywords: Market structure, Industry structure, External challenges, Three joys, Source and supply chain

1. History background

After the reform and open policy, China's economy has been increased rapidly, and there was a great demand for cars. But the domestic automobile industry was not that developed at that time and could not meet with such a great demand. So in the 1980s, Chinese automobile industry started to join hands with the foreign companies and improve the technology.

Among all the foreign companies, the most typical and successful ones are Volkswagen and Honda.

The Volkswagen Company started to enter the Chinese market in 1984 with production base in Shanghai. It is one of the earliest manufactures set up business in China. And it set up another joint venture in Changchun in 1990. Until today , the company owns 14 enterprises in the whole mainland of China.

The Honda Company entered Chinese market in 1994, but their early business was manufacturing some car components. Not until 1998, did the company set up its first production base in making cars in Guangzhou , China.

From the statistics of market shares in 2006, we can see that both companies have achieved great success.

1949-1980

1956: The first modern automobile factory First Automobile Works began production.

March 10, 1958: The first 2½ tones light duty truck (NJ130), which was based on the Russian GAZ (GAZ-51?), was produced in Nanjing. Named 'Guerin' brand by China's First Ministry of Industrial Machinery.

June 1958: Nanjing Automobile Work, which previously was a unit in the Third Field Army, was established. The truck production continued until the last truck (NJ134) rolled off the assembly line on July 9, 1987. Cumulative production was 161,988 (Includes versions like: NJ130, 230, 135 and 134).

late 1950s to 1960s: Several automobile factories were set up in Nanjing (today is Nanjing Automobile (Group) Corporation, Shanghai (today is Shanghai Automotive Industry Corporation), Jinan (evolving into China National Heavy Duty Truck Group), and Beijing (today is Beijing Automotive Industry Holding Corporation).

1968: The Second Automobile Works (later Dongfeng Motor Corporation) was founded.

1980s

Three big joint-ventures and three small joint-ventures:

Shanghai Automotive Industry Corporation - Volkswagen: Santana mid-size/compact car.

First Automobile Works - Volkswagen: Volkswagen Jetta compact car.

Dongfeng Motor Corporation - Citroën: Citroën Fukang compact car.

Beijing Automotive Industry - DaimlerChrysler: Jeep Cherokee.

Guangzhou Automobile Industry Group - Peugeot : Peugeot 504 (subsequently defunct). (However, in the 90s, Honda replaced Peugeot as the partner of Guangzhou Auto, and producing the Accord and the Fit with huge success. And in 2006, it started to manufacture Toyota Camry, with huge success also. Making Guangdong province the center of Japanese makes auto manufacturing in China now.)

Tianjin Automotive Industry - Daihatsu : Daihatsu Charade (merged with FAW/Toyota joint-venture).

After 1990

Several enterprises entered the automobile industry since 1994. Some of them are originated from defense industry, such as Chang'an Motors, Changhe, and Hafei Motor; some were developed from old state-owned companies, such as Brilliance China Auto, BYD Auto, Chery Automobile, and Changfeng Automobile. Others are private-owned companies, such as Geely Automobile, Great Wall Motors.

Insert Table 1 Here

2. The Chinese automobile market

By a first look on the growth rates of the Chinese car market you can only be impressed. In 2007 the car market increases dramatically. 37 % more cars were sold than the year before while the European car market was growing slowly and the US car market has had a growth rate near to 0 %.

Additionally impressive is the number of car builders in China. More than 80 Chinese companies are producing cars at the moment. This huge amount of competitors needs a form of organisation so that they can be successful not only in China but in the whole world. Up to now the majority of these companies are quit unknown abroad and so the Shanghai Automotive Industries Corporation (SAIC) and Nanjing Automobile decided to develop standards in design, the production process and the sales management of these companies in order to raise the export rate of Chinese cars.

The potential of the Chinese car market is gigantic. At the moment there are about 30 million cars in China. If China would have the same cars-per-person-rate like the European Union 870 million would have been to be sold there additionally. More than 70 % of all Chinese are saving money in order to buy an own car.

In face of these figures and prospects also a lot of foreign car builders try to enter the Chinese market in the hope to participate from the high demand for cars. Many of them thought that just being on the market will lead to high sale-rates and economic success. Toyota from Japan, GM from the USA, Volkswagen, Daimler and Audi expected that they could sell even more cars on the Chinese market than on in their country of origin. They used different strategies that lead only in some cases to high sales. The different strategies on selling cars of German Volkswagen and the Chinese car company Honda will be discussed later. But even now it can be said that only by offering cars that hit the Chinese requirements and wishes a car builder can be successful on this growing market.

By having a closer look on the sales figures Volkswagen is very successful in selling their cars in China. In 2008 it is expected that Volkswagen sells more cars on the Chinese market than on its home market in Germany. A reason is that the demand for practical, daily use cars is very high. Volkswagen also has a very good reputation by being one of the cheapest German car builders. In contrast to that the German premium car builders like Daimler and Audi are in concurrence with other foreign companies like Lexus (Toyota), Volvo and Infiniti (Nissan). Even these premium brands have high growth rates although the prices of their cars are extremely high compared to the average Chinese salary. An additional problem for these companies is local regulations that for instance forbid driving cars with strong engines in big cities like Beijing.

Another question that has to be answered is: Do the Chinese prefer foreign cars to cars from China and why? First of all it has to be said that in China cars are like nearly everywhere in the world status symbols. For example driving an Audi A8 is closely connected to having a good job and being successful in life. At the moment there do not exist many Chinese luxury cars. To a certain degree the Chinese do not have the choice if they want to buy a premium car with good reputation they have to buy a foreign car. On the other hand the Chinese car builders develop and grow very fast. Probably it would be big mistake to underestimate their potential. Especially the history shows that in the first year none of the old “Western” car builders expected Toyota from Japan as being a real competitor. Nowadays Toyota is famous for being innovative (e.g. hybrid car) and successful all over the world.

Moreover I think as a country of economic importance China will try to establish an own strong car brand that represent their technical progress.

3. ‘Olympic Program’ - The Strategic View of Volkswagen in China

Volkswagen was the first company entering the Chinese automobile industry. Faced by a satisfied home market the company had to expand its business and therefore the growing economy of China was their next choice.

The Volkswagen Beetle, the first car produced for the Chinese market, was a real success. After several years competitors, mainly from the Japanese market like Honda, started to enter the Chinese market very aggressively and due to that Volkswagen had to face the challenge to maintain its market leader position and therefore adopt the corporate strategy.

As a consequence Volkswagen China introduced its ‘Olympic Program’ strategic plan in 2005. The program is called ‘Olympic’ since its aim is to reach the strategic goals set by the end of the Olympic year 2008.

In the following we will analyze the strategic plans of Volkswagen and set them in context to the strategic behaviour of the Japanese competitor Honda.

3.1 Marketing

Volkswagen announced to focus more on differentiation. This is due to the existence of two joint ventures and the planned positioning of the Skoda products. By offering a large product variety the group aims to serve as many different target customer groups as possible.

In opposition to previous product designs the new cars offered by Volkswagen will be adapted to Chinese taste in order to increase the brand's popularity. The former Volkswagen products were designed for the European market but since Japanese car manufacturers fit better to the Asian taste the company had to react. The Volkswagen products in China compete on quality but to maintain the company's leading position it is unremitting to produce cars that are both fashionable and qualitative.

3.2 Sales

Sales relationships are going to be restructured and there will be more interaction between the two joint ventures FAW VW and VWS. These strategic interactions are another way to increase the company's customer orientation and thereby the attractiveness of the brand. Dealerships will be tailored to the newly-defined customer group's segmentation of the two joint ventures respectively. Vehicles of the Volkswagen brand will be distributed through two dealer network channels. By this, Volkswagen aims at its strategic goal to maintain its leading position by serving different customer groups.

3.3 Research and Development

The company focuses more on in-house developments within the Volkswagen joint ventures in China to save costs. Ten to twelve new models developed in China for the Chinese market should be launched by the end of 2008.

3.4 Sourcing and Supply Chain

Historically the two joint ventures VW Shanghai FAW VW in Changchun sourced separately but within the last decade sourcing became more challenging for the company: the cars are becoming more sophisticated and therefore the components have to fulfil higher expectations, the technical expertise of the supplier is getting more important and it is difficult for Volkswagen to find suppliers which meet their requirements, lack of availability of certain raw materials (e.g. specific kinds of steel) cause sourcing difficulties.

As a reaction Volkswagen is trying to introduce a common sourcing process for the global group and bundle the purchasing volume in China to create economies of scale. Thereby the target is to find one supplier for each platform part and carry these parts to China.

3.5 Manufacturing

In order to decrease production costs the board decided to introduce so called 'product cost workshops' within the manufacturing departments to communicate cost targets and 'produce to costs'. Also large parts of the manufacturing process will be done in China and localization in China are planned to be increased to make use of the cheaper labour wages in China. Besides all plans to reduce production costs Volkswagen tries not to compromise its high engineering quality and manufacturing standards since this is a very important success factor for the company.

4. Honda strategy in China

Honda advocates the spirit of three joys.

Because of their belief in the value of each individual, Honda believes that each person working in, or coming in touch with their company, directly or through their products, should share a sense of joy through that experience. This feeling is expressed in what they call "The Three Joys". Their goal is to provide Joy: for those who buy their products and produce their products. In that regard, their main concern is for people.

First, there is "The Joy of Buying" for every customer who buys a Honda

This Joy is a step beyond customer satisfaction. As they define it, there are four steps to successfully creating The Joy of Buying. The customer must first understand the product and its fundamental concept. Second, the customer should accept the product and make the decision to buy the product. Third, the customer must be completely satisfied with the product. Finally, the customer will experience The Joy of Buying if the company can provide products and services that exceed their customers' expectations.

Second, there is "The Joy of Selling". To achieve The Joy of Selling, what is important is not just the relationship between the customer and their products. Their products provide the opportunity for a human

Those who sell and service Honda's products seek to respond sincerely to customers' needs and desires. When the quality and performance of the products are excellent, those who are engaged in selling and servicing the products are proud to represent Honda to the customer. When their sales and service network.

Especially Honda's dealers and distributors, experience that pride and a positive relationship with our customers, they feel The Joy of Selling.

Third, there is "The Joy of Producing". At Honda, the Joy of Producing

Including manufacturing, production engineering, research and development, and Honda suppliers, by producing quality products that exceed the expectations of our dealers and our customers, we can experience pride in a job well done.

When we realize The Three Joys, we should also be creating joy for society as a whole. Because of the industry we are in, we affect society in many ways. Some are positive – such as personal mobility, the pride of owning a spirited and valued product and the provision of employment opportunities. Some are negative – such as the environmental impact of our product. Social issues, especially safety and environmental concerns, are among the most pressing needs of our society.

We also pick up another 4 strategy of Guangzhou Honda in China. Firstly, large scales of purchasing; Honda uses their economies of scale by working with their parts suppliers to order raw materials in large quantities.

Secondly, suppliers' localization, more than 160 component suppliers around Guangzhou Honda to manufacture some supports component for automobiles. For example, the glass seat and engine. These parts are supplied not only for Guangzhou Honda but also sometimes for exporting. What's more, setting up manufacturing base for transmission in Guangzhou really makes a record, because this is the first time for foreign-funded automobiles enterprises to set up transmission manufacturing base in China. And this investment of Honda makes the supplier localization especially the suppliers for core parts.

Thirdly, optimizing logistics process. They use logistics management software from USA.The logistics department of Guangzhou Honda was demanded to operate according to the pattern in Janpese Logistics Company. They emphasize importing the service quality in logistics, decreasing logistics cost enlarge market share and competitiveness and import new technology and methods in logistics from USA.

Fourthly, making supply chain perfect. The Honda setting up a local transmission manufacturing base in Guangzhou makes transmissions no longer popular in importing and components industrial chain in China will develop to perfect. the newly set-up base will provide transmissions to three Honda companies in China(Guangzhou Honda,Dongfeng Honda and China Honda)In this pattern, the most crucial part of automobile---engine production has been promoted a lot.

In the influence of transmission localization. The biggest supplier of clutch in Japan set up a factory in 5 years with the total investment---54million dollars in Nanhai District in Guangzhou and it manufacture clutch for Guangzhou Honda directly.

With the localization of supplier of transmission and clutch the supply chain of Guangzhou Honda has developed into nearly perfect.

Honda's strategy in supply chain can considerably decrease the cost which gives Guangzhou Honda more profits.

Then we move on to the comparison of the marketing between Volkswagen and Honda. Firstly, for Honda they launch a new car later in China compared with in Japan. For example, the Accord in 2008 was launched half a year later in China than in Japan. But for Volkswagen, a new car will have a same launching agenda all over the world; it means same time promoting same time marketing.

Secondly, Honda adjusts the price to the situation of market nearly every season. Demand fluctuation, price fluctuation. The flexible price strategy is different from Volkswagen's steady price strategy which perhaps gives consumers more reliability.

Thirdly, Honda fight for market share and Volkswagen emphasize brand reputation in long term, Honda target consumers which means flexible strategy will be much easier for company to survive and succeed. While for Volkswagen, more luxury and exclusive element allow Volkswagen to offer more credence for consumers in order to gain reputation in long term.

5. The future of Chinese automotive industry

The future of the automotive industry in China can be said to be depending on certain factors: the market structure; the industry structure and external challenges.

5.1 Future market structure

There are two different pictures among Chinese industrial leaders about how the market will develop. Either they suggest steady growth or they suggest exponential growth. With steady growth China will be competing with the USA about being the largest market by 2015. When GDP per capita increase the vehicle sales do the same thing. With the assumption that there is a crucial point in the GDP per capita where the households regards their income as enough for affording a car, there could be a possibility for a dramatic increase in the automotive sales. The potential of the Chinese

automobile market is big; a figure from 2005 says that on average 1000 Chinese people own 24 vehicles, which could be compared to the global average that at the same time was 120 vehicles per 1000 people. A steady growth instead of an exponential might though have the positive implication that it will give the Chinese government time to develop better circumstances for the industry. It might as well give time for the manufacturers, suppliers and dealers to grow in a healthy speed, with a better potential to sustain in the long run. The long run sustainability may be threatened if the industry has to react too quickly to a sudden market growth since the time will be to less to develop a good knowledge base as well as capital resources.

An important issue in the future market structure is the potential to develop new financing alternatives for car buyers. Special vehicle loans may trigger the demand for new cars, while the necessity of paying a very big part of the car in cash may lead people rather to choose to buy a used car or a less expensive new car. That the financial companies create a trust among consumers is therefore important and it will make it easier for people to make decisions about buying not only cars but also accessories, insurance and service to the cars.

5.2 Industry Structure

The development of the automotive industry is very depending on the industry structure. Since China does not have an old tradition in making good quality cars, as several other countries, knowledge must either be imported or developed by the Chinese automotive companies. As an own development of a knowledge base and technology may be costly both in the form of time and money, the import of these features may in many cases be preferable. A way of making this import can be via mergers and acquisitions of companies from outside of china, who has got the demanded knowledge and technological skills. Another way of taking advantage of international development is by joint ventures between Chinese and foreign companies. Something that is very important for getting the best result out of the joint venture is that the two companies develop a way of trusting on each other. In other words they have to over bridge the fear that the other company will steel the competences, using them by themselves in later stages. For a positive development to take place in terms of mergers, acquisitions and joint ventures, the government can play a key roll by deregulating the market and setting policies encouraging these activities. Of course the market competition may also push companies to consolidate.

5.3 External challenges

Regarding the external challenges, the infrastructure plays an important roll. The possibilities of using a car may of course influence the decision of buying a car or not. Today there are still big development possibilities concerning the traffic system in China. The connections between cities in urban and rural China still need improvement. Additionally the whole traffic management, concerning traffic planning, traffic-flow and congestion may need enhancement. The gas stations need also to be more spread out and the number of parking spaces in the cities should be increased. All these factors are essential for the Chinese automobile market to extend.

Another factor that must be taken seriously is the effect on the air of an increase of the Chinese motor vehicle population. Also an even bigger augmentation in the demand for oil may be an important feature for the future car industry in China. This can in fact have a big impact on the global oil supply. These aspects will raise the question of making cars with smaller consumption and alternative fuel cars. That incentives are given for the car manufacturers to develop and produce these cars are therefore important. Here the government plays a central roll, as it can stimulate the demand for these kinds of cars, something that may be essential for the Chinese automotive industry in the long term.

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Table 1. Auto. Sales by Leading Manufacturers in 2006

Rank	Firms	Sales (1000 Units)	Shares(%)
1	Shanghai Automotive Industry Corporation (Group)	1224	20.22
2	China FAW Group Corporation	1165.7	19.26
3	Dongfeng Motor Coporation	932.3	15.40
4	ChangAn Automobile (Group) Liability Co.,Ltd	708.7	11.71
5	Beijing Automotive Industry Group Corporation	685.1	11.32
6	Guangzhou Automobile Group Co.,Ltd	352.3	5.82
7	Chery Automobile Co.,Ltd	302.5	5.00
8	Harbin Hafei Automobile Industry Group Co.,Ltd	266.8	4.41
9	Huachen Automotive Holding	210.2	3.47

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The Relationship between Defense, Education and Health Expenditures in Selected Asian Countries

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Abstract

This study explores the inter-relationship between military expenditure, education expenditure and health expenditure in eight selected Asian countries namely Malaysia, Indonesia, Singapore, Philippines, Bangladesh, Nepal, Sri Lanka and South Korea. Autoregressive Distributed Lag-Restricted Error Correction Model (ARDL-RECM) procedure was utilized in the analysis. The empirical results suggest that, except for the case of Malaysia and Sri Lanka, whereby no meaningful interrelationship was detected between these three variables, the results for the rest of the countries are mixed, with differing granger causality being detected among these variables. The mixed results obtained in this study is an indicator of differing policy being implemented and will result in varying implication. Generally the error correction term is significant. Implying there is long-run relationship between defense spending, education and health expenditure.

Keywords: Defense, Education, Health, Error correction model

1. Introduction

The portion of the budget in a nation that is dedicated to development, security and welfare varies across nation. It is a very important decision and has to be dealt cautiously and is a matter of utmost importance to policy makers. Lindgren (1984) explains in his review of literature, that it is found that there are two main traditions of empirical studies on the consequences of defense spending in industrialized market economies. One is the Marxist influence from Baran and Sweezy (1968) where defense spending is seen as necessary for the survival of capitalism. Another is the investigation of trade-offs (reduced civilian components when defense spending is increased). Though many more researchers would like to investigate and explore this hypothesis, lack of data and inconsistencies of data, is hindering them to do so. It is a well known secret that data on defense spending are very confidential in nature. From these limited studies, results are often mixed.

Defense spending is believed to have meaningful relationship with the other two variables chosen due to a number of reasons. Firstly, any increase in military expenditure could be at the expense of public spending on social programs such as health and education which in turn will have an equalizing effect. Secondly, the taxes required to support

defense spending may fall disproportionately on the middle classes; if so, post-tax income inequality might be at a risk of increasing. Finally, high levels of defense spending may reflect the use of violence as a means of social control, notably against trade unions and other egalitarian social forces thus; it is not surprising to witness that higher defense spending means more societal control and a sacrifice of egalitarian values.

There is also another possibility, which is good governance, whereby, the respective governments carefully planning their policies and budget, so that military expenditure would not stand in the way of spending on other important aspects, such as education, health, public amenities etc. A sentiment shared by Apostolakis (1992), who mentioned that the use of any resource has an opportunity cost in the alternative instances that are foregones; it is a common thesis through that some burdens are more burdensome than others. He further cautions that the net effect of defense spending calls for a careful investigation. Caputo (1975) was one of the earlier studies on public policy implications of military and welfare expenditures. The subject became more popular and much more researches were conducted, however most of these researches were centered around military expenditure and economic growth, such as to name a few, Hassan et al. (2003), Al-Yousif (2002), Shieh et al. (2002), and Kollias et al. (2004a and 2004b).

The purpose of the present study is to explore the inter-relationship between military expenditure, education expenditure and health expenditure in eight selected Asian countries. There eight Asian countries namely Malaysia, Indonesia, Singapore, Philippines, Bangladesh, Nepal, Sri Lanka and South Korea. This paper is organized as follow, whereby in the next section, we discuss the prior literature. The third section consists of the discussion on the methodology and sources of data. The following section we discuss the results and the last section is the conclusion.

2. Review of related literature

Yildrim and Sezgin (2002) investigate the possible trade-off between Turkish defense spending on health and education expenditure during the Turkish republican era. The study cover the period from 1924-1996 using a multi-equation framework employing the Seemingly Unrelated Regression Estimation (SURE) method. They claimed that while defense spending decisions are made independently of health and education expenditure, there is a trade-off between defense and welfare spending. While the trade-off is negative between defense and health, it is positive between defense and education. They conclude that there is a competition between education and health expenditure in the budgeting process.

The same results were shared by Caputo (1975) whose study is considered as the new perspective on the public policy implications of defense and welfare expenditure in four modern democracies from 1950 - 1970. He found significant departure from prior research finding and suggests that the assumption of an explicit trade-off between defense expenditure and welfare expenditures be reconsidered. Meanwhile in another study, Dabelko and Mc Cormick (1977) examined the impact of changes in military spending on spending levels for public health in a number of countries for selected years from 1950-1972. Their major findings are: (1) opportunity cost does exist for education and health across all nations and all years, but they are weak in magnitude; (2) levels of economic development have little or no impact upon the opportunity costs for these policy areas; (3) personalist regimes tend to have higher opportunity cost of defense than do centrist and polyarchic regimes.

Scheetz (1992) examined the evolution of public sector expenditures which examines central administration functional expenditure for four Latin American countries over the last twenty years. He found that defense expenditure is the single largest (and most volatile) functional outlay, often greater than all public sector social functions combined. On top of that, from 1969 through 1987 (except in Peru) the defense function grew faster than health and education, with defense generally crowding out these social expenditures. Third, military regimes tend to spend more on defense than do civilian regimes. And lastly, police share are inversely related to the country's level of development. On the other hand, Apostolakis (1992) studied the warfare – welfare expenditure substitutions in Latin America from 1953 – 1987. He employs three alternative econometric specifications based on time–series data. He concludes that, overwhelmingly, military expenditure expenses crowd out the potential allocations for social upgrading. He also found positive link only in the defense-public works spending.

Frederiksen (1991) examined the defense and growth causality issues for six Asian countires. He determined on a country by country basis the optimal lag structure for the defense and growth variables for period 1956 through 1988 based on combines Granger causality and Akaike's final prediction error (FPE). He indicated that the lag structure differs from country to country as hypothesized. He also concludes that the causal relationship differs from country to country. On the other hand, Looney and Frederiksen (1990) examined the determinants of defense spending in six Asian countries namely the Philippines, Indonesia, South Korea, Malaysia, Thailand and Singapore. Their research suggested that economic variables and resources availability were the main determinants of military expenditure in the six countries.

Fitzgerald (2006) studied the association between serving active military duty and wealth accumulation. The study using data from the first wave of the health and Retirement study in 1992, the sample cover 5800 men to determine the

relationship between the lengths of time spent on active military duty and net worth. He found that there is an economic disincentive to serve in the military, which may affect the ability of veterans to accumulate wealth and future military recruitment.

Lai and Thyne (2007) examined the negative effects of civil wars and the post-civil war environment on educational expenditure and enrollment from 1980 through 1997. They use a measure of when a state is in civil war, a dynamic post-civil war measure an interaction with military spending, and relevant control variables for examine the percent change in educational expenditure and primary, secondary and tertiary enrollment for all states. They conclude that strong support for the notion that civil war is devastating for a system of education, as both expenditures and enrollment decline during a civil war. They also found no support for the reallocation of education funds towards military spending during a civil war.

3. Methodology

ARDL Approach to Causality Test

In order to test for causality between defense spending, education and health expenditure we utilized the Autoregressive Distributed Lag Model to Restricted Error Correction Model (ARDL-RECM). Error-correction model is likely to have better statistical properties than the two-step Engle-Granger method because, unlike the Engle-Granger method, the ECM does not push the short –run dynamics into the residual term (Banerjee et al., 1998). The ARDL-RECM approach provides robust result in a small sample size. Since the sample size of our study is small, this model is found to be the most appropriate procedure for this study.

The regressands are used interchangeably in order to explore the multi possibilities in the Granger causality.

The ARDL restricted error correction model (RECM) is shown below:

$$\Delta LD_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1,i} \Delta LD_{t-i} + \sum_{i=1}^{m} \alpha_{2,i} \Delta LE_{t-i} + \sum_{i=1}^{m} \alpha_{3,i} \Delta LH_{t-i} + \gamma_1 ecm_{t-1} \quad (1)$$

$$\Delta LE_t = \beta_0 + \sum_{i=1}^{m} \beta_{1,i} \Delta LD_{t-i} + \sum_{i=1}^{m} \beta_{2,i} \Delta LE_{t-i} + \sum_{i=1}^{m} \beta_{3,i} \Delta LH_{t-i} + \gamma_2 ecm_{t-1} \quad (2)$$

$$\Delta LH_t = \gamma_0 + \sum_{i=1}^{m} \gamma_{1,i} \Delta LD_{t-i} + \sum_{i=1}^{m} \gamma_{2,i} \Delta LE_{t-i} + \sum_{i=1}^{m} \gamma_{3,i} \Delta LH_{t-i} + \gamma_3 ecm_{t-1} \quad (3)$$

For model (1) the hypothesis is:

H_o: health expenditure and/ or education expenditure granger cause defense spending

H_a: health expenditure and/ or education expenditure doesn't granger cause defense spending

For model (2) the hypothesis is:

H_o: health expenditure and/ or defense spending granger cause education expenditure

H_a: health expenditure and/ or defense spending doesn't granger cause education expenditure

For model (3) the hypothesis is:

H_o: education expenditure and/ or defense spending granger cause health expenditure

H_a: education expenditure and/ or defense spending doesn't granger cause health expenditure

whereby D is the ratio of defense spending to GDP, E is ratio of education expenditure to GDP, H is the ratio of health expenditure to GDP, Δ is the first difference operator, L denote variables in logarithm and ecm_{t-1} are the error correction term. The significant of the error term will indicate long run relationship between the three variables. The long run causality can also be inferred from the error term.

Description and sources of data

The data used in this study are annual data on defense, education and health for the selected Asian countries. The data covers the period for 1971 to 2006. The countries are Bangladesh, Indonesia, Korea, Malaysia, Nepal, Philippines, Singapore and Sri Lanka. All the data set for defense spending, education expenditure and health expenditure was obtained online from Key Indicators for Asia and the Pacific provided by Asian Development Bank (ADB). All the expenditure data was then divided by the Gross Domestic Product to obtain the ratio to GDP value. All the data used in the study were transformed into logarithm.

4. Empirical results

Before conducting the causality test, we tested the data series for the order of integration namely for defense spending, education and health expenditure. We conducted the unit root test to determine the order of integration of the series. The

Augmented Dickey-Fuller (ADF) tests are reported in Table 1 and Table 2. The null hypothesis of unit root cannot be rejected at the 5 percent level of significance for the series in levels, while for the series in first difference, the null hypothesis of *I(1)* can be rejected at the 5 percent level of significance. Clearly the ADF test statistic indicates that defense spending, education and health expenditure series in selected Asian countries are stationary after first differencing (I(1)).

Having determined that all series are integrated of order one *I(1),* we proceed for the testing of cointegration between the variables, based on ARDL framework. Interestingly the F statistics value obtained, compared with the critical values by Narayan (2005), are below the critical value of I(0), signalling no cointegration among these variables. Resulting from these results, we proceed for the testing of long-run causality from the restricted ARDL-RECM model. The results are shown in Table 3. From the results it can clearly observed that, for the case of Philippines and Sri Lanka, no meaningful relationship could be detected from the study among these three variables. For the case of Bangladesh, unidirectional causality runs from health to defense, and subsequently from defense to education. As for the case of Indonesia, bidirectional causality between education and health is detected and defense is found to have no meaningful relationship whatsoever.

For South Korea, bidirectional causality is detected between education and defense; on top of that there exist a unidirectional causality running from education to health. In the case of Malaysia, unidirectional causality is found running from health to education. For Nepal, education is being granger caused by both health and defense. Finally, for the case of Singapore, bidirectional causality between education and health, and education granger cause defense. Table 3 also displays the results of the error correction term, for all the equations, all the countries; generally they are significant and negative (sign of a stable relationship). As for the results of the Table 4, which contains the long run coefficient, the conclusion is, for the relationship between defense and education, the results are mixed. For Bangladesh, Nepal, Malaysia, Korea and Indonesia, the results indicates positive relationship (complements) while for Singapore and Sri Lanka the results indicates negative relationship and for Philippines no meaningful relationship could be detected. As for the relationship between defense and health, the results are ambiguous. Lastly for the results for the relationship between education and health, it is very consistent, positive relationship for all the countries (complements)

5. Conclusion

In this study the Autoregressive Distributed Lag-Restricted Error Correction Model (ARDL-RECM) procedure was employed to investigate the inter-relationship between military expenditure, education expenditure and health expenditure in eight selected Asian countries namely Malaysia, Indonesia, Singapore, Philippines, Bangladesh, Nepal, Sri Lanka and South Korea. The sample period was 1970 – 2005 and the data was annual. All the data went through log-log transformation so that the estimates will be less sensitive to outliers or influential observations and also in order to reduce the data range.

The results are not surprisingly mixed, however, one thought provoking aspect is that, the results of Bangladesh and Nepal is in support with Caputo (1975) who found significant departure from prior research finding and suggests that the assumption of an explicit trade-off between defense expenditure and welfare expenditures be reconsidered. We also find that defense spending is positively significant with education in Bangladesh and Nepal. This can be attributed to the fact that these two poor countries, while increasing defense spending, invest in human capital. However it is in contrary with Yildrim and Sezgin (2002) who claimed that while defense spending decisions are made independently of health and education expenditure, there is a trade-off between defense and welfare spending. While the trade-off is negative between defense and health, it is positive between defense and education. They conclude that there is a competition between education and health expenditure in the budgeting process.

As for the results of Sri Lanka and Philippines whereby we failed to find any meaningful relationship between these three variables, it can be concluded as a sign of good governance and good policy making, whereby the decisions of military expenditure is independent and does not have any whatsoever impact on health expenditure and education expenditure.

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Table 1. Results of ADF Unit Root Test for Series in Level

Country	LD		LE		LH	
	ADF *t*-statistic	Lag	ADF *t*-statistic	Lag	ADF *t*-statistic	Lag
Bangladesh	1.316	8	-2.721	0	-3.260	0
	[0.99]		[0.23]		[0.09]	
Indonesia	-1.787	0	-2.120	0	-2.093	0
	[0.68]		[0.51]		[0.52]	
Korea	-2.126	0	-2.166	0	-1.817	0
	[0.51]		[0.49]		[0.67]	
Malaysia	-2.489	0	-3.057	1	-2.556	0
	[0.33]		[0.13]		[0.30]	
Nepal	-2.363	0	-2.982	1	-3.231	1
	[0.39]		[0.15]		[0.09]	
Philippines	-3.033	0	-1.673	1	-2.440	0
	[0.13]		[0.74]		[0.35]	
Singapore	-2.962	0	-2.496	2	-3.309	0
	[0.15]		[0.32]		[0.08]	
Sri Lanka	-1.678	0	-2.982	1	-2.950	2
	[0.73]		[0.15]		[0.16]	

Notes: Asterisk (*) denotes statistically significant at 5% level.

Table 2. Results of ADF Unit Root Test for Series in First Difference

Country	LD		LE		LH	
	ADF *t*-statistic	Lag	ADF *t*-statistic	Lag	ADF *t*-statistic	Lag
Bangladesh	-3.939* [0.00]	4	-5.653* [0.00]	0	-6.227* [0.00]	0
Indonesia	-5.530* [0.00]	0	-5.714* [0.00]	0	-4.537* [0.00]	0
Korea	-6.390* [0.00]	0	-5.227* [0.00]	0	-5.282* [0.00]	0
Malaysia	-6.066* [0.00]	0	-4.194* [0.00]	2	-6.652* [0.00]	0
Nepal	-5.709* [0.00]	0	-4.036* [0.00]	1	-10.621* [0.00]	0
Philippines	-4.886* [0.00]	0	-4.031* [0.00]	1	-5.598* [0.00]	0
Singapore	-5.437* [0.00]	0	-4.114* [0.00]	0	-7.102* [0.00]	0
Sri Lanka	-5.782* [0.00]	0	-7.432* [0.00]	1	-7.370* [0.00]	0

Notes: Asterisk (*) denotes statistically significant at 5% level.

Table 3. Results of Long-Run Causality from the (ARDL-RECM) Model

Country	Dependent variables	t-statistics of restriction ecm term - ARDL models:	Diagnostic Testing		Remarks		Lags
		ecm_{t-1}	R-Squared	DW-Statistic	cointegration	causation	
Bangladesh	Δ LD	-4.4658*	0.75295	1.8892	Yes	Yes: E&H => D	(1,0,2)
	Δ LE	-4.1779*	0.64055	1.8325	Yes	Yes: D&H=> E	(1,2,0)
	Δ LH	-4.5941*	0.67448	2.0074	Yes	Yes: D&E => H	(1,0,1)
Indonesia	Δ LD	-1.5765	0.37922	2.1155	No	No: E&H ≠> D	(1,1,0)
	Δ LE	-4.4839*	0.53872	2.1423	Yes	Yes: D&H => E	(1,0,0)
	Δ LH	-4.0316*	0.42783	2.1041	Yes	Yes: D&E => H	(2,0,0)
Korea	Δ LD	2.0675*	0.45585	1.7310	Yes	Yes: E&H => D	(2,2,0)
	Δ LE	-3.2828*	0.33688	1.6845	Yes	Yes: D&H => E	(1,0,0)
	Δ LH	-1.3448	0.16447	1.7425	No	No: D&E ≠> H	(1,1,0)
Malaysia	Δ LD	-0.4756	0.51016	2.2912	No	No: E&H ≠>D	(1,1,0)
	Δ LE	-2.7605*	0.68701	1.4608	Yes	Yes: D&H => E	(1,0,1)
	Δ LH	-4.6191*	0.69547	2.0683	Yes	Yes: D&E => H	(1,1,0)
Nepal	Δ LD	-2.6225*	0.29858	1.6686	Yes	Yes: E&H => D	(1,0,0)
	Δ LE	-1.5372	0.37091	2.4129	No	No: D&H ≠> E	(1,1,0)
	Δ LH	-5.0810*	0.48895	2.2165	Yes	Yes: D&E => H	(1,0,0)
Philippines	Δ LD	-1.1539	0.22381	1.8109	No	No: E&H ≠> D	(1,0,1)
	Δ LE	-1.8027	0.37567	1.9594	No	No: D&H ≠> E	(2,1,0)
	Δ LH	-2.1596*	0.36936	2.2270	Yes	Yes: D&E => H	(1,0,1)
Singapore	Δ LD	-3.5815*	0.47410	1.9666	Yes	Yes: E&H => D	(1,0,0)
	Δ LE	-3.3095*	0.44159	1.6521	Yes	Yes: D&H => E	(1,0,0)
	Δ LH	-5.3547*	0.63898	1.8114	Yes	Yes: D&E => H	(1,0,1)
Sri Lanka	Δ LD	-1.2988	0.25904	2.0485	No	No: E&H ≠> D	(1,0,1)
	Δ LE	-3.6226*	0.38204	1.8650	Yes	Yes: D&H => E	(1,0,0)
	Δ LH	-4.2581*	0.44481	1.6968	Yes	Yes: D&E => H	(1,0,0)

Notes: Asterisk (*) denotes statistically significant at the 5% level. LD denotes defense spending, LE denotes education spending and LH denotes health spending. The lag was chosen automatically by the test, using the SBC criterion.

Table 4. Long-Run Coefficient

Bangladesh						
				Remarks		
Dependent/independent variables	LD	LE	LH	LD,LE	LD, LH	LE, LH
LD	-	0.6311	-0.2965	C	S	-
LE	0.8261	-	0.9396	C	-	C
LH	0.7252	0.1399	-	-	C	C
Indonesia						
Dependent/independent variables	LD	LE	LH	LD,LE	LD, LH	LE, LH
LD	-	-	-	-	-	-
LE	0.2716	-	0.4952	C	-	C
LH	0.2183	0.6320	-	-	C	C
Korea						
Dependent/independent variables	LD	LE	LH	LD,LE	LD, LH	LE, LH
LD	-	3.9151	-0.1639	C	S	-
LE	0.3320	-	0.1750	C	-	C
LH	-	-	-	-	-	-
Malaysia						
Dependent/independent variables	LD	LE	LH	LD,LE	LD, LH	LE, LH
LD	-	-	-	-	-	-
LE	0.0814	-	0.3940	C	-	C
LH	-0.1107	0.9881	-	-	S	C
Nepal						
Dependent/independent variables	LD	LE	LH	LD,LE	LD, LH	LE, LH
LD	-	0.6855	-0.0964	C	S	-
LE	-	-	-	-	-	-
LH	0.0118	0.3446	-	-	C	C
Philippines						
Dependent/independent variables	LD	LE	LH	LD,LE	LD, LH	LE, LH
LD	-	-	-	-	-	-
LE	-	-	-	-	-	-
LH	0.9902	0.1477	-	-	C	C
Singapore						
Dependent/independent variables	LD	LE	LH	LD,LE	LD, LH	LE, LH
LD	-	-0.0111	0.6286	S	C	-
LE	-0.5372	-	2.0256	S	-	C
LH	0.5453	0.2447	-	-	C	C
Sri Lanka						
Dependent/independent variables	LD	LE	LH	LD,LE	LD, LH	LE, LH
LD	-	-	-	-	-	-
LE	-0.0043	-	0.4165	S	-	C
LH	0.0114	0.4205	-	-	C	C

Notes: Asterisk (*) denotes statistically significant at the 5% level. LD denotes defense spending, LE denotes education spending and LH denotes health spending. C denotes complement, S denotes substitute.

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Time Series Behavior of Imports and Exports of Bangladesh: Evidence from Cointegration Analysis and Error Correction Model

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Abstract

Bangladesh, a developing economy, contains trade deficit from her very inception. This paper makes an effort to understand the time series behavior of total export and total import of Bangladesh. Unit root tests recognize the existence of random walk in total export and total import time series. Johansen cointegration test reveals long-run equilibrium relationship between these two variables. Getting the existence of cointegration, the study attempts to find causal relationship using error-correction mechanism. Test results unveil bidirectional long term causality and unidirectional short term causality between import and export of Bangladesh. Findings of the study corroborate that Bangladesh is not in violation of its international budget constraints.

Keywords: Stationarity, Cointegration, Export, Import, Causality, Error-correction mechanism.

1. Introduction

International trade is the basic activity by which a country establishes its economic relationship with other countries. At present, liberalization of trade is a common phenomenon for most countries. Liberalization of trade policy significantly came into being in Bangladesh from 1991. Whatever is the concentration for liberalization, all the countries put extensive concern for gaining trade balance. A country's trade volume reflects the collective effects of other macroeconomic policies. To investigate collective effect of many policies on international trade, one can look for the long-run equilibrium relationship between export and import. Investigation regarding Bangladesh's export and import from time series perspective is not a new affair. But, as time moves on, researchers get continuously increasing room for analyzing time series behavior. So, I undertake investigation of time series behavior of Bangladeshi imports and exports considering all fiscal years (1972-73 to 2007-08) of independent Bangladesh.

Trade volume surely has effects of time as import and export demand of a country does not change overnight. Therefore, understanding time series behavior of trade volume can be insightful for trade policy analysis. In this connection, the study of time series behavior of trade volume has gathered weight in macroeconomic research.

In the literature there are several investigations relating to Bangladesh from the viewpoint of time series econometrics; such as Anam and Rahman (1991), Bhuiyan and Rashid (1993), Hossain (2000, 2001, 2003), Yilmaz and Verma (1995), Hossain (2005, 2006), Uddin et al (2008). The use of time series analysis, searching for random walk and cointegration, is extensive in macroeconomic literature. I outline some of those relating to trade and macroeconomic indicators, as Husted (1992), Powell (1991), Cuddington and Urza (1989), Deaton and Laroque (1989), Grilli and Yang (1988), Cochrane (1988).

Now, I am presenting the findings of some trade related studies available in the literature. Bahmani-Oskooee and Rhee (1997) found cointegration between exports and imports of South Korea. Bahmani-Oskooee (1998) used cointegration approach to find out the long run trade elasticities in least developed countries (LDCs). Tang (2006) studied cointegrating relationship between exports and imports of 27 selected Organization of the Islamic Conference (OIC) member countries. The study found cointegrating relationship between exports and imports of Bangladesh, Cameroon, Chad, Guyana, Indonesia, Mali, Morocco, Niger and Senegal; and all of them are developing countries. The remaining 18 countries provided no evidence of cointegration. Choong et al (2004) got cointegrating relationship between exports and imports of Malaysia. Cheong (2005) focused on several technical issues of Choong et al's work and concluded that cointegrating relationship between exports and imports of Malaysia cannot be generalized without considering several technical issues raised by him. Irandoust and Ericsson (2004) studied cointegrating relationship between exports and imports of some developed countries, named as France, Germany, Italy, Sweden, the UK and the USA. The study found cointegration for Germany, Sweden and the USA but it was rejected for the UK. Irandoust and Ericsson (2004) focused on policy implications of cointegrating relationship between exports and imports. According to Irandoust and Ericsson (2004), cointegrating relationship between exports and imports may explain that a country is not in violation of her international budget constraints and that trade imbalances are short term phenomenon and macroeconomic policies have

been effective to bring exports and imports into equilibrium in the long-run. They (Irandoust and Ericsson) also concluded that no cointegration between exports and imports indicates major policy problems in the economy and the existence of productivity gap. So, cointegrating relationship between exports and imports cannot be attributed with either developed countries or developing countries. Arize (2002) explained that cointegration between exports and imports is an important element for formulating macroeconomic policies intended to achieve trade balance. Baharumshah et al (2003) got existence of cointegrating relationship between imports and exports for Indonesia, Philippines, Thailand, but not for Malaysia.

Tomšík (2001) investigated long term equilibrium relationship of Czech import and export function using 1993-1998 data. However, he found cointegrating relationship in the import function only. Wu and Zhang (1998) searched for cointegrating relationship between imports and exports of the USA with Japan, and found cointegrating relationship. Konya and Singh (2008) used 1949-50 to 2004-2005 trade data of India to find the existence of long-run equilibrium relationship and ended up with a result of no such relationship. Jalil (2008) investigated cointegrating relationship considering 1976-2006 data between exports and imports of Bangladesh and failed to get any such relationship, which is contradictory to the findings of Tang (2006). Narayan and Narayan (2004) found cointegrating relationship between exports and imports of both Fiji and Papua New Guinea.

2. Background of Bangladeshi Trade Pattern

Bangladesh, an emerging economy, experienced inward-looking economic philosophy in the 1970s. In the 1980s liberalization of trade and deregulation started and gradually moved forward. In the first half of 1990s level of liberalization became noteworthy as financial and capital accounts were liberalized. In the total time span of independent Bangladesh, it maintains sizeable trade deficit. As level of liberalization influences trade volume of a country, this study tries to portray some characteristics of Bangladeshi trade in pre liberalization (1972-1991) and post liberalization (1991-2008) period (Table 1). Table 1 explains that there are no significant differences in average growth rates of export and import in pre liberalization and post liberalization period. But there is significant difference in average growth rates of trade deficit between pre liberalization and post liberalization periods. Trade pattern of the total time span is also depicted in Figure 1.

3. The Data

The study considers yearly time series data of, i) nominal import value of Bangladesh (*Imp*), and ii) nominal export value of Bangladesh (*Exp*) ranging from 1972-73 to 2007-08 (all the fiscal years after the independence of Bangladesh). The study also include two ratio variables, which are nominal exports of Bangladesh as a percentage of her nominal GDP (*Exp/Gdp*), and nominal imports of Bangladesh as a percentage of her nominal GDP (*Imp/Gdp*). Data gathered from different publications of the Bangladesh Bank (BB) and the Ministry of Finance, Bangladesh. Ratio variables obtained through calculation and all the data series transformed to natural log form.

4. Econometric Methodology

Primarily this study tests the existence of unit root (random walk) in the aforesaid time series data. This study also requires investigation regarding cointegrating relationship between *Imp* and *Exp*, and between *Exp/Gdp* and *Imp/Gdp*. This study employs unit root test for understanding the presence or absence of random walk (nonstationarity), which in turn, helps to determine the predictability of future values based on past values of a time series.

In the **unit root tests**, the augmented Dickey- Fuller (ADF) test consists of estimating the following regression:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \in_t$$

where, Δ is the difference operator, $\in_t$ is a white noise error term and

$\Delta Y_{t-1} = (Y_{t-1}-Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$ etc. The null hypothesis is that $\delta = 0$; that is there is a unit root and the alternative hypothesis is that $\delta < 0$; that means the time series is stationary.

The Phillips and Perron (PP, 1988) test is based on estimating the following statistic.

$$\xi_\alpha = t_\alpha \left(\frac{\gamma_0}{f_0} \right)^{\frac{1}{2}} - \frac{T(f_0 - \gamma_0)(se(\overline{\alpha}))}{2 f_0^{\frac{1}{2}} s}$$

Where, $\overline{\alpha}$ is the estimate, and t_α the t ratio α, $se(\overline{\alpha})$ is the coefficient standard error, and s is the standard error of the test regression. In addition γ_0 is a consistent estimate of the error variance. The remaining term f_0, is an estimator of the residual spectrum at frequency zero.

After the test of stationarity, this study uses Johansen (1991, 1995) **cointegration test** to identify the existence of any cointegrating relationship between *Imp* and *Exp*, and between *Exp/Gdp* and *Imp/Gdp*. Whenever, someone gets two time series as nonstationary or *I(1)* then s/he can consider that the future values of a variable are not predictable based on past values. But there are still chances that two time series may share a common trend. That means, two variables are cointegrated if they have a long term equilibrium relationship between them.

The Johansen cointegration test (1991, 1995) is based on the following vector autoregression (VAR) equation.

$y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + Bx_t + \epsilon_t$

Where y_t is a k- vector of non-stationary *I(1)* variables, x_t is a *d*-vector of deterministic variables and ϵ_t is a vector of innovations.

The VAR can be rewritten as,

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + Bx_t + \epsilon_t$$

where

$$\Pi = \left(\sum_{i=1}^{p} A_i \right) - I \quad , \qquad \Gamma_i = - \sum_{j=i+1}^{p} A_j$$

If the coefficient matrix Π has reduced rank $r < k$, then there exist $k \times r$ matrices α and β each with rank r such that $\Pi = \alpha \beta'$ and $\beta' y_t$ is stationary. r is the number of cointegrating relations and each column of β is the cointegrating vector. Johansen proposes two different likelihood ratio test of significance named as trace test and maximum eigenvalue test, which are represented by following equations.

$$Q_{trace} = -T \sum_{i=r+1}^{k} \log \left(1 - \lambda_i\right)$$

$Q_{max} = - T \log (1-\lambda_{r+1}) = Q_r - Q_{r+1}$

Here T is the sample size and λ_i is the *i*-th largest eigenvalue. The trace statistic tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of k cointegrating vectors. Whereas in the maximum eigenvalue statistic tests the null hypothesis of r cointegrating vectors against the alternative of $r+1$ cointegrating vectors.

According to Granger (1988), if the variables are integrated of order *I(1)* and are cointegrated, then there must exist at least oneway causation. If the variables are cointegrated, the existence of an error-correction representation may take the following form:

$$\Delta X_t = \alpha + \sum_{i=1}^{m} \beta_i \Delta X_{t-i} + \sum_{j=1}^{n} \gamma_j \Delta Y_{t-j} + \delta ECM_{t-1} + u_t$$

$$\Delta Y_t = a + \sum_{i=1}^{q} b_i \Delta Y_{t-i} + \sum_{j=1}^{r} c_j \Delta X_{t-j} + dECM_{t-1} + v_t$$

where *ECM* explains the error-correction mechanism term. This ECM_{t-1} is the one period lagged value of the estimated error of the cointegrating regression obtained from OLS (Ordinary Least Squares) estimation. The logic behind this model is that generally a long-run equilibrium relationship between two economic variables exists. But, in the short run there can be disequilibrium. Therefore, the error correction mechanism corrects a proportion of disequilibrium in the next period. So, the error correction process is an instrument of reconciling short-run and long-run behavior. In the error correction model, β_i/b_i & γ_j/c_j are the short-run dynamic coefficients and δ is the long-run coefficient, u_t & v_t are white-noise residuals. The absolute value of δ determines how quickly the equilibrium is restored. Conversely, in the absence of cointegration, a vector autoregression (VAR) needs to be constructed using first differences of the variables. In this case error correction term is excluded from the above specified equation. In identifying the causal relationship, the t-statistics explains the existence of long-run causality, while the significance of F-statistic indicates the presence of short-run causality.

5. Empirical Results and Discussion

I put all the four variables (*Exp, Imp, Exp/Gdp, Imp/Gdp*) for unit root tests to examine the nature of the variables as *I(0)* or *I(1)*. I summarize the results of each test in a single table for analytical ease. For the ADF test (Table 2.1) two time series (*Imp and Imp/Gdp*) show the existence of unit root in all the three different consequences using the level form of

data. *Exp* and *Exp/Gdp* series indicate stationarity or *I(0)* at level form of data, only for the instance of constant & linear trend. As first differences of a nonstationary time series are stationary (Gujarati 2003), I also conduct unit root test by using first differenced data of four variables. All the four variables show stationarity except one instance of *Exp* series (when considering 'none' option). Therefore, by considering results from level data and first differenced data I can consider all the data series as nonstationary or *I(1)*. The PP test (Table 2.2) signifies the existence of unit root in all cases at 1% level of significance, while considering first differenced data. But, by using the level data I get evidence of stationarity in *Exp, Exp/Gdp, and Imp/Gdp* series, if considering constant & linear trend. According to both the ADF and PP unit root tests, *Exp* and *Exp/Gdp* series have stationarity in level form of data, if constant and linear trend are considered. In contrast, both the series appear as stationary according to the ADF and PP unit root tests at 1% level of significance, considering first differences form of data. As such form of contradiction arises from a single instance (constant & linear trend), it can be considered that all the four variables are nonstationary or *I(1)*. So there is possibility that *Exp* & *Imp,* and *Exp/Gdp* & *Imp/Gdp* time series may move together in the long-run or may share a common trend in the long-run. As *Exp* & *Imp,* and *Exp/Gdp & Imp/Gdp* time series are nonstationary; it is appropriate to carry out the cointegration test.

Table 3 posts results of pair wise Johansen's cointegration test under two different assumptions (no deterministic trend and linear deterministic trend). Johansen's conintegration test detects at least one cointegrating relationship between *Exp* & *Imp,* and *Exp/Gdp & Imp/Gdp* for both assumptions. Results of trace statistic and maximum eigenvalue statistics produce little contradiction, which is related to the significance level of cointegrating relationships. However, one should give more importance to trace statistics, as trace statistic considers all of the smallest eigenvalues, it holds more power than the maximum eigenvalue statistic (Kasa, 1992; Serletis and King, 1997). Moreover, Johansen and Juselius (1990) recommend the use of the trace statistic when these two statistics provide conflicting results. So, cointegrating relationship between *Exp* & *Imp,* and *Exp/Gdp & Imp/Gdp* is evident; that means, *Exp* & *Imp,* and *Exp/Gdp & Imp/Gdp* series share stable long-run relationships. Moreover, cointegrated import and export of a country explains that the country is not in violation of her international budget constraints and macroeconomic policies of the country have been effective in bringing total exports and imports into a long-run equilibrium (Irandoust and Ericsson 2004). So, the results of cointegration test of this study contradict with that of Jalil (2008). Such contradiction can be a result of differences in time periods or differences in calendar year data (used by Jalil, 2008) and fiscal year data (used in this study). It is important to note that, Tang (2006) found cointegrating relationship between exports and imports of Bangladesh.

As Granger (1988) spotlight on the possibility of causal relationship resulting from cointegration between or among the variables, I proceed to investigate unidirectional or bidirectional causality between *Exp* & *Imp,* and *Exp/Gdp* & *Imp/Gdp*. The cointegrated variables necessitate inclusion of the error-correction term as an added channel through which Granger causality can be revealed. According to Granger (1986), the ECM generates better short-run forecasts and provides the short-run dynamics necessary to obtain long-run equilibrium. From the technical point of view, the error-correction term measures the speed of adjustments to establish the long-run equilibrium.

Table 4 reveals long-run bidirectional causality between *Exp* & *Imp*, as reflected by the coefficients of the error-correction terms and the respective t-values which are significant at 1%. There is also evidence of short-run causality running from *Imp* to *Exp*, as the F-statistic is significant at 1% level of confidence. *Exp/Gdp* and *Imp/Gdp* are also having long-run bidirectional causality as expressed by the error-correction terms and the respective t-values' that are significant at 1%. *Exp/Gdp* and *Imp/Gdp* also hold bidirectional short-run causality that is portended by the significance of the F-statistics. Moreover, the significant error-correction term indicates that about 44% of disequilibrium is corrected each year by the changes in *Imp* to bring the long-run equilibrium between *Exp* and *Imp*. On the other hand, about 32% of disequilibrium is corrected each year by a decline in *Exp* to bring the long-run equilibrium between *Exp* and *Imp*. A similar type of explanation can be derived for *Exp/Gdp* and *Imp/Gdp* using the error-correction term indicated in Table 4.

6. Conclusion

This study reveals that total imports and total exports of Bangladesh follow random walk or are considered as nonstationary time series. There is also evidence of long-run cointegrating relationship between *Exp* & *Imp,* and *Exp/Gdp* & *Imp/Gdp*, as the Johansen cointegration test detect at least one cointegrating equation for both the pairs. As cointegrated variables are expected to have causal relationships, I investigate the causal relationship between *Exp* & *Imp,* and *Exp/Gdp* & *Imp/Gdp* by specifying the error-correction mechanism. According to the results, long-run bidirectional causality exists between *Exp* & *Imp*, and short-run unidirectional causality exists from *Imp* to *Exp*. Moreover, bidirectional short-run and long-run causality exist between *Exp/Gdp* and *Imp/Gdp*. So, according to Irandoust and Erricsson (2004), Bangladesh is not in violation of its international budget constraints and trade imbalances of Bangladesh are a short-run event, which in the long-run are sustainable. Cointegrating relationship of trade also explains an economy as well-functioning because the deficits are evanescent that will be balanced by future surpluses.

Therefore, the macroeconomic policies of Bangladesh have been effective in bringing total exports and imports into a long-run equilibrium.

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Table 1. Average growth rate of trade components

Trade components	1972-1991	1991-2008	1972-2008
% of average export growth	20.5631	18.1179	19.3754
% of average import growth	19.5672	16.0300	17.8492
% of average growth in trade deficit	23.0413	14.4967	18.8911

Table 2.1. Unit Root Test Using ADF (Calculated and critical values)

Variables	Constant		Constant & Linear		None	
	Levels	$1^{st}\Delta$	Levels	$1^{st}\Delta$	Levels	$1^{st}\Delta$
Exp	-1.0095	-8.1475**	-3.6333*	-8.1015**	5.3032	-1.1627
Imp	-0.7716	-8.7377**	-3.0857	-8.8881**	4.9660	-2.2116*
Exp/Gdp,	-0.8422	-7.1617**	-4.5544**	-8.1863**	-1.8458	-6.7700**
Imp/Gdp	-2.1270	-9.1167**	-3.3483	-8.9330**	-0.7344	-8.9633**
Critical value 1%	-3.6394	-3.6394	-4.2436	-4.2528	-2.6347	-2.6392
Critical value 5%	-2.9511	-2.9511	-3.5442	-3.5484	-1.9510	-1.9516

Notes:
1. Using critical values by Mackinnon, 1996
2. * indicates stationarity at 5% level and ** indicates stationarity at 1% level
3. Lag length automatically chosen (by EViews 5) using Schwarz Information Criterion (SIC)

Table 2.2. Unit Root Test Using Phillip-Perron (Calculated and critical values)

Variables	Constant		Constant & Linear		None	
	Levels	$1^{st}\Delta$	Levels	$1^{st}\Delta$	Levels	$1^{st}\Delta$
Exp	-0.3244	-8.2468**	-3.6004*	-8.1015**	6.9484	-3.7889**
Imp	-0.7716	-8.6838**	-2.9169	-8.8881**	6.4346	-4.7867**
Exp/Gdp,	0.0331	-9.5396**	-4.6328**	-10.0714**	-1.7431	-6.7700**
Imp/Gdp	-1.9475	-9.7891**	-3.5677*	-9.5708**	-0.8736	-9.4026**
Critical value 1%	-3.6329	-3.6394	-4.2436	-4.2528	-2.6326	-2.6347
Critical value 5%	-2.9484	-2.9511	-3.5442	-3.5484	-1.9506	1.9510

Notes: 1. Using critical values by Mackinnon, 1996
2. * indicates stationarity at 5% level and ** indicates stationarity at 1% level
3. Bandwidth chosen according to Newey-West using Bartlett kernel

Table 3. Results of Johansen cointegration test (pair wise)

Null hypothesis	Alternate hypothesis	Variables	Trace statistic	Max-Eigenvalue statistic
r = 0	r = 1	*Exp/ Imp*	33.6215***	28.9167***
r ≤1	r = 2	No deterministic trend	4.7048	4.7048
r = 0	r = 1	*Exp/ Imp*	27.2017**	17.4673*
r ≤1	r = 2	Linear deterministic trend	9.7343	9.7343
r = 0	r = 1	*(Exp/Gdp)/(Imp/Gdp)*	22.4417**	21.0594***
r ≤1	r = 2	No deterministic trend	1.3822	1.3822
r = 0	r = 1	*(Exp/Gdp)/(Imp/Gdp)*	27.6197**	17.7634*
r ≤1	r = 2	Linear deterministic trend	9.8563	9.8563
Null hypothesis	Alternate hypothesis	Level of Critical values	Trace statistic	Max-Eigenvalue statistic
r = 0	r = 1	at 5%	20.2618	15.8921
r ≤1	r = 2	No deterministic trend	9.1645	9.1645
r = 0	r = 1	at 5%	25.8721	19.3870
r ≤1	r = 2	Linear deterministic trend	12.5179	12.5179

Note:
1. Critical values based on MacKinnon-Haug-Michelis (1999)
2. * indicates significance at 10% level, ** indicates significance at 5% level and *** indicates significance at 1% level
3. Considered lag length 2 according to LR (likelihood ratio) test

Table 4. Results of Error-correction/Causality

Dependent variable	Causal variable	F-statistics	Constant (t-statistic)	Error correction term (t-statistic)
Δ *Exp*	Δ*Imp*	5.8789**	3.8322 (10.0380)**	0.4424 (5.5616)**
Δ*Imp*	Δ *Exp*	2.5223	-3.0699 (-12.5654)**	-0.3201 (-3.0832)**
Δ*Exp/Gdp*	Δ *Imp/Gdp*	3.3769*	0.0561 (1.6189)	0.4402 (3.0884)**
Δ *Imp/Gdp*	Δ*Exp/Gdp*	4.9685**	-0.0859 (-3.4634)**	-0.1601 (-4.2989)**

Note:
1. Δ indicates first difference
2. lag length kept similar to the lag length used for cointegration test
3. No deterministic trend included in the VAR equations
4. * indicates significance at 5% level and ** indicates significance at 1% level

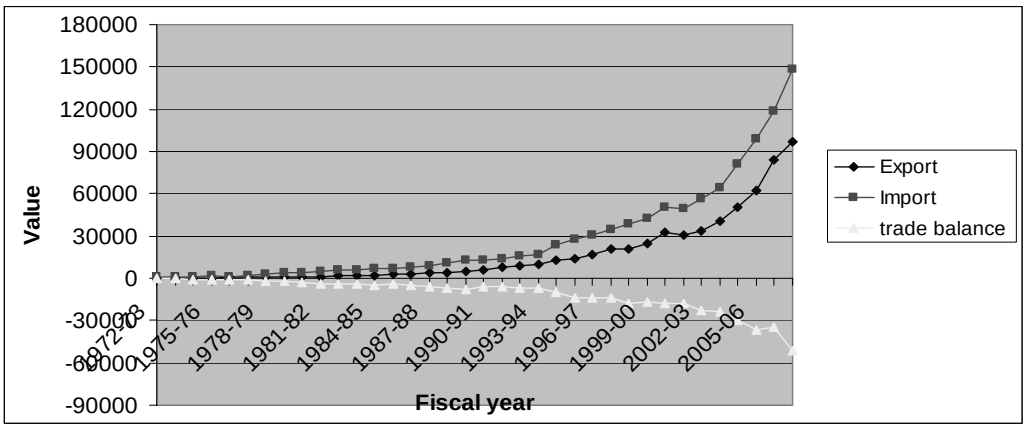

Figure 1 Value of exports, imports and trade balance

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Analysis on the Relationship between Overlapping Free Trade Area and Multilateral Trade Agreement

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Abstract

The overlapping free trade area (FTA), as one prominent phenomenon in the development of FTA after the 1990s, has influenced the multilateral trade system (MTS) greatly. This article has proved that the special advantages of spoke countries can bring about cohesive effect on the industries through adopting the analytical method of infinitely repeated game, and the spoke countries will face a discriminatory treatment, resulting in decentralization effect. The overlapping free trade agreement has the feature of self-execution, and compared with the traditional FTA, it is more likely to meet the conditions of incentive compatibility constraint with MTS.

Keywords: Overlapping Free Trade Agreement, Rules of Origin, Incentive Compatibility, Sustainability

1. Introduction

Along with the trend of economic globalization, the economic communication among the countries has been deepened increasingly; at the same time when all the countries are benefiting from the economic globalization, they have to face serious uncertain risks. For not only getting the effect of trade creation brought by regional preferential arrangement but also reducing the risks because of opening, choosing regional economic organization becomes a suboptimal strategic choice of each country. At present, such organizations are mainly shown as FTA, Customs Union, the Common Market, and Economic and Monetary Union, most of which are at the phase of Customs Union or FTA. The FTA has been the primary choice of many countries thanks to its features like finiteness of the sovereignty release, directness of benefiting as well as easy access to agreement. Thus, numerous overlapping FTAs appeared in the late 1990s. As this phenomenon develops rapidly, the overlapping free trade agreement will influence the running of regional economic organizations and MTS significantly. This issue has been analyzed by many scholars from different angles. Some analyze whether the development of FTA plays a promoting or obstructing role in MTS; some analyze the incentive compatibility between the Customs Union and MTS by means of static game; some analyze the self-execution of interregional trade agreement with the method of dynamic game; and some also analyze the distribution of market power and profit of member countries by FTA and Customs Union. All of the analysis is the study centering on simple relationship between FTA or Customs Union and MTS, but researches on the relationship between the overlapping free trade agreement as a special phenomenon after the 1990s as well as regional organization specially arranged and MTS are relatively few. Nevertheless, this article makes up for the flaw to some extent by analyzing sustainability of the overlapping free trade agreement and its incentive compatibility with MTS with a kind of trade model provided.

In order to analyze the issue deeply, the article adopts the imperfect competition model of four countries and four commodities, among which three countries constitute two FATs respectively with one being the hub and two being the spoke, the fourth country isn't included this area. Additionally, each of the four countries produces a kind of imperfect competition commodity. For simplicity of the model, it is assumed that scales of the member countries are symmetrical, and consumers in all countries have the same preference. And in the first-order game, both each individual FTA and the multilateral trade agreement meet the conditions of incentive compatibility constraint. Based on this assumption, the article analyzes the optimal tariffs of the hub and spoke countries firstly; then the self-executing mechanism of overlapping FTA, as well as the incentive compatibility with the multilateral trade agreement, is analyzed, so is the political and economical effects of the overlapping free trade agreement finally.

The article is divided into five parts, namely, introduction, development status of the overlapping FTA, model, political and economical effects of the overlapping free trade agreement and conclusion.

2. Development Status of the Overlapping FTA

In the more than a decade recently, the global regional economic cooperation organizations have developed rapidly. According to the report of World Bank, by the end of 2007, the number of regional trade agreements notified to WTO had increased from 50 in the 1990s to 380. In addition, 60 regional agreements were at different negotiation stages, and there also were considerable ones not notified to WTO for various reasons. Development of the regional trade changed the original pattern of trade in the world to a relatively large extent. And volume of trades between interregional countries took up about 40% in the global trade volume at the end of 2004. Another attractive phenomenon is that almost all countries have joined in one regional economic organization at least, and some are even in the mode of a group. As a result, a large number of overlapping free trade agreements spring up.

The overlapping free trade agreement refers to the phenomenon that one county (area) concludes free trade agreements respectively with many countries (areas). This concept indicated the "star" system put forward by Park in the beginning, which was gradually replaced by the "hub-and-spoke" system later [E]. When one county (area) concludes free trade agreements respectively with many countries (areas), it will act as a hub while others are just like the spokes, between which there are no free trade agreement. If one spoke country signs agreements with many countries, this condition is called multi-level overlapping free trade agreement, which is not discussed in the article. Currently, many overlapping free trade agreement are springing up, so some countries become the hub countries as well as the spoke ones. Among the member countries of WTO, 97% participate in the free trade agreements, and most of them participate in not only one]. Counties of EU have signed at least 19 agreements with countries in EFTA, and Columbia, Venezuela, Chile and some countries in Central America have signed 8-18 such agreements. The U.S. has signed the CUSFTA with Canada and North American Free Trade Agreement (NAFTA) with Mexico. At present, its negotiation with Chile has been finished, and it is boosting the construction of FTAA. Furthermore, the three countries in NAFTA are also member countries of APEC (the developed countries in APEC will complete the establishment of FTA in 2010 while the developing countries in 2020.). This leads to that some countries become hub countries, such as the U.S., Mexico, Chile, Singapore, etc. With respect to Mexico, it has concluded 10 free trade agreements, including the U.S., Canada, Chile, Bolivia, Columbia- Venezuela, Nicaragua, Costarica, EU, EFTA, Israel and Guatemala-El Salvador-Honduras. Countries and regions concluding the free trade agreements with Chile include Ecuador, Venezuela, Bolivia, Peru, South American Common Market, EU, Canada, Mexico and the U.S. Singapore in Asia also signs agreements with Japan, New Zealand-Australia and the U.S. EU carries out expansion towards the east, signing agreements with 10 counties of ASEAN, Euro-Med Agreement with Mediterranean countries and agreements with South Africa and Mexico, and is negotiating with the South American Common Market and Chile. If the condition goes like this, EU will become a large hub area, and other countries will become spoke ones. In such complex overlapping free trade agreement, some countries become the hub countries while some become spoke ones. Many economic and political issues are resulted from different executing time of agreements, discrepancies between covered commodities and different provisions in the rules of origin. Absolutely, the overlapping free trade agreement is not as simple as it seems.

3. Trade Model

An international trade model of four countries and four commodities is established in the article, assuming that consumers of all countries share the same preference and constant elasticity of substitution (CES). In the model, there are two FTAs with one country being the hub, two being the spokes and the fourth being a country outside the area. Infinitely repeated game is performed between countries belonging to or not belonging to the area in the established trade model. The assumption that economic structures of intraregional countries are symmetrical avoids the negotiation between intraregional countries. The article mainly analyzes the internal self-executing mechanism of overlapping free trade agreement, and the incentive compatibility between the area and MTS.

3.1 Setting of the model

The four countries in the trade model are represented by 1, 2, 3 and 4, among which 1 and 2 make up a FTA, 2 and 3 make up another FTA and 4 is a country not belonging to the area. Due to such setting, 2 become a hub country, and 1 and 3 become the spoke ones. Each of the countries produces a kind of commodity. Member countries of a FTA have the right to set external tariffs independently, so tariffs of 1, 2 and 3 are t_1, t_2 and t_3 respectively, and that of 4 is t_4 or t^*. Tariff in the area is zero. Utility functions of member countries in the area are u_1 (t_1, t_2, t_4), u_2 (t_1, t_2, t_3, t_4) and u_3 (t_2, t_3, t_4) respectively, where there is a implicit assumption, that is, 1 and 3 in the two areas only trade with 2 respectively, and there is no direct economic contact between 1 and 3. Additionally, along with external tariff increase of each country, the utility will increase ($\frac{\partial u}{\partial t_1} \geq 0$, $\frac{\partial u}{\partial t_2} \geq 0$, $\frac{\partial u^*}{\partial t_4} \geq 0$); this assumption maintains the trade mode of "prisoners' dilemma", that is, every country won't reduce its tariff unilaterally for the sake of maximized benefits. Meanwhile, along with the occurrence of overlapping free trade agreement, levels of welfare in the intraregional countries will increase, while that

of the country outside the area will decrease reversely. ($\frac{\partial u}{\partial t} \geq 0, \frac{\partial u^*}{\partial t} \leq 0$)

Based on the assumption above, utility level of each country is:

$u^i = \left[\sum_{j=1}^{N} (C_j^i)^{\vartheta}\right]^{\frac{1}{\vartheta}}$, where N means the quantity of traded commodities, and u^i means the utility level of country i;

C_j^i shows consumption of commodity j in country i, and p_j^i refers to price of commodity j in country i. Condition for realizing utility maximization for consumption is:

$$\frac{c_j^i}{c_k^i} = \left(\frac{p_j^i}{p_k^i}\right)^{-\delta} \tag{1}$$

Where, $\delta = \frac{1}{(1-\vartheta)}$ is the elasticity of substitution of consumption.

In order to indicate the trade model correctly, three parameters are added, α, β, δ, among which α is the quantity of traded commodities, reflecting relative advantage of the commodity, β is the area scale, and δ is the elasticity of substitution of consumption.

Because 2 is the hub country, trading with 1 and 3, it is equivalent to a FTA constituted by three countries; 1 and 3 are spoke countries, equivalent to that each pure FTA trades with the country outside the area. So utility function and budget constraint of each intraregional country are:

Utility function of 1:

$$u^1 = \left[\frac{\beta}{3}(c_1^1)^{\vartheta} + \frac{\beta}{3}(c_2^1)^{\vartheta} + \beta^*(c_4^1)^{\vartheta}\right]^{\frac{1}{\vartheta}} \tag{2}$$

Budget constraint: the consumption value of one country at the world price equals to the income value.

Budget constraint of 1:

$$\sum_{j=1}^{3} \beta_j q_j c_j^1 = \alpha q_1 + \sum_{j=1}^{3} \beta_j q_j \tag{3}$$

Utility function of 2:

$$u^2 = \left[\frac{\beta}{3}(c_1^2)^{\vartheta} + \frac{\beta}{3}(c_2^2)^{\vartheta} + \frac{\beta}{3}(c_3^2)^{\vartheta} + \beta^*(c_4^2)^{\vartheta}\right]^{\frac{1}{\vartheta}} \tag{4}$$

Budget constraint of 2:

$$\sum_{j=1}^{4} \beta_j q_j c_j^2 = \alpha q_2 + \sum_{j=1}^{4} \beta_j q_j \tag{5}$$

Utility function of 3:

$$u^3 = \left[\frac{\beta}{3}(c_3^3)^{\vartheta} + \frac{\beta}{3}(c_2^3) + \beta^*(c_4^3)^{\vartheta}\right]^{\frac{1}{\vartheta}} \tag{6}$$

Budget constraint of 3:

$$\sum_{j=1}^{3} \beta_j q_j c_j^3 = \alpha q_3 + \sum_{j=1}^{3} \beta_j q_j \quad (7)$$

Substituting the budget constraint and consumption condition of each country into corresponding utility function

Proposition 1: Supposing external tariff level of each country is the same, in the overlapping free trade agreement, utility level of hub countries is higher than that of the spoke countries. That is, $u^2 > u^3$ or $u^2 > u^1$.

In the first place, there are rules of origin in each free trade agreement, and which are of certain differences mutually. As described by Bhagwati, overlapping free trade agreement is just like pot and bowl, bringing about multiple duplicate to the rules of origin, and it is applied to almost any place and any product as a large number of non-tariff barriers. If a country concludes different free trade agreements with a number of countries, commodities between the hub country and other spoke countries could flow freely, while trade between the spoke countries must face tariff barriers. Products of spoke countries must enter the hub country first, and then enter other spoke countries. In order to comply with the rules of origin, spoke countries will purchase more intermediate input goods from the hub country to make them into final products, and then export to other spoke countries through the hub country; or invest to set up factories in the hub country. It is obvious that producers in the hub country obtain special returns in the overlapping free trade agreement, while these in spoke countries are in the face of relatively discriminatory treatment.

In the second place, the overlapping free trade agreement brings about a re-allocation effect on industries inside the area. In the FTA, there is no tariff barrier among member countries, and commodities in the area could flow freely; a country's trade structure will change along with it and has re-allocation effect on its industries eventually. Effects of FTA on industrial re-allocation are embodied in two aspects: one is the structural readjustment of industries outside the area and inside the area; the other is the structural readjustment of industries between the member countries in the area. For structural readjustment of industries between countries outside the area and inside the area, as countries outside the area face a variety of tariff barriers, they will enter the FTA by means of direct investment, which, obviously will lead to the cohesive effect of industry in the area. For industry allocation among member countries in the area, simple FTA will result in the flow of resources to the area of high returns, getting industrial structure in the area optimized. However, as for the overlapping free trade agreement, industries in the area will show an obvious specialization effect of cohesion and decentralization due to the emergence of Hub-and-Spoke. Taking the FTA in the model for example

Assuming that there is no chain relationship of input and output between companies in the area, and each country could produce products of relatively great elasticity of substitution, in respect that products manufactured in country 2 could have access to the 1 and 3. Therefore, products of country 2 will face a market of great demand, while the similar products manufactured by 1 or 3 could only enter country 2 to be in the face of a relatively small market demand. Products manufactured by country 2 have the effect of increasing returns to scale; along with the increase in demand, its production scale will expand and the costs of products will be reduced, becoming more competitive than similar products manufactured by 1 and 3; more and more production of such products will be carried out in country 2, and that in 1 and 3 will decline gradually, and there will be cohesive effect of industry. This is the “Hub Effect” brought up by Krugman. Assuming that there is the relationship of input and output between companies, products manufactured by 1 or 3 will be in an unfavorable condition initially due to the decline in market demand, however, in respect that there is link mechanism of input and output between companies, country 2 will mainly engage in the production of final products, while 1 and 3 will process intermediate input goods respectively in accordance with its own resources, so as to enter country 2 with duty-free treatment, which reduces the overall production costs and improves the international competitiveness, and enables such products to be exported to countries outside the area. As a result, in the area, there will appear cohesive effect of industry in the hub country and specialization effect of decentralization in spoke countries. The strength of this effect depends on the degree of trade barriers between spoke countries; the higher the trade barriers, the stronger the sensitivity of industrial allocation to the cost (as shown in the diagram below).

Insert Figure 1 Here

Note: T_1T_3 refers to trade barriers between 1 and 3; I_2 represents the degree of industry cohesion in country 2. A represents industrial equilibrium state in the state of global free trade.

When the trade barrier between 1 and 3 is higher than 1.68, cohesive effect of industry will appear suddenly in country 2.

3.2 Preference to tariff rate

Among analyses on tariff between countries inside and that outside the area, the well-known argument is Kemp-Aan’s tariff adjustment condition, $\frac{dt}{dI_1}$ at is, external tariff of the Customs Union shall be reduced to such a degree that countries

outside the area are not sensitive to its internal tariff. If the external tariff level of Customs Union comes up to this standard, benefit level of member countries in the area will be raised for being a component of the Customs Union, and that of countries outside the area will not be decreased either. In the overlapping free trade agreement, it is assumed that each FTA keeps in touch with countries outside separately, therefore the spoke country 1 and 3 are of the same optimized external tariff level, and it is in line with the conditions in the first order. That is, $\frac{\partial u^1}{\partial t_1} = 0, \frac{\partial u^3}{\partial t_3} = 0$, while the hub country attaches more emphasis on economic interests in the area in respect that it is at a particular position. Therefore, the scale of external tariff level is not important. According to previous assumptions, member countries in the area tend to have high tariff, and the hub country will choose a higher external tariff consequently. In order to make up for the discriminatory status in the area, spoke countries will balance the level of tariffs, choose appropriately lower external tariffs, and attract resources of countries outside the area.

3.3 Self-execution mechanism of the overlapping free trade agreement

First of all, we assume that there is a simple FTA, to ensure that this FTA remains sustainable in an unlimited number of repeated games, the following conditions must be met:

$$u\left(t^i, 0, t^*\right) + \sum_{\tau=1}^{\infty} u\left(t^i, t^j, t^*\right)\delta^t \le \sum_{\tau=0}^{\infty} w(0,0,t)\delta^t \tag{8}$$

The first part on the left is the utility level when member countries in the area adopt the optimum tariff in first-order game, and τ is the period of time; the second part is the discounting of profits obtained by member countries in the area when they are punished for deviating from the cooperation; what on the right refers to the utility level during the cooperation of member countries in the area.

To make the overlapping free trade agreement sustainable, it only requires that utility levels of spoke countries meet requirement of (8).

Utility levels of spoke countries shall meet the following requirement:

$$u\left(t^2, 0, 0, t^*\right) + \sum_{\tau=1}^{\infty} u\left(t^1, t^2, t^3, t^*\right)\delta^\tau \le \sum_{\tau=0}^{\infty} w\left(t^2, 0, 0, t^*\right)\delta^\tau$$

Generally, utility level of hub country is higher than that in the spoke countries due to its particular status, and the hub country will not deviate from cooperation in the area, on the contrary, it will take the initiative to strengthen regional cooperation; however, if we consider the impact of interest groups, it will be difficult to determine.

Proposition 2 When the initial state of 1, 2, 3 is symmetrical, that is, when $t_1=t_2=t_3$, if 2 is hub country, while 1 and 3 are spoke countries, country 4 will not steer the gear of trade from 1 and 3 to country 2 because country 2 is the hub country when the tariffs of t1 and t3 are reduced to such a level, then overlapping free trade agreement is of sustainability and nature of self-execution.

If the external tariffs of t_1, t_3 are higher, countries outside the area are sure to steer the gear of trade from 1 and 3 to country 2, so as to be in line with the rules of origin and gain the maximum economic benefit; on the contrary, if external tariffs of t_1, t_3 are reduced to a degree low enough, and country 2 is of preference to high tariff, country 4 will not change its direction of trade; benefit levels of 1 and 3 will not reduce for being spoke countries and deviate from the agreement of regional cooperation. Only in this way could the overlapping free trade agreement have sustainability.

$$\frac{\partial u}{\partial t_1} \ge 0$$

$$\frac{\partial u}{\partial t_3} \ge 0$$

3.4 Incentive compatibility of the overlapping free trade agreement and multilateral agreement

On the relationship between FTA and MTS, Ai Ze is of the opinion that the MTS promotes the development of open regional organizations; Kruger points out those regional organizations will arouse the objection of interest group to MTS. With the appearance of a large number of overlapping free trade agreements, we need to reexamine the relationship between free trade agreement and MTS.

If FTA and multilateral free trade agreement could satisfy the incentive compatibility constraints, the development of FTA will not be an obstacle to the MTS. Incentive compatibility constraints shall meet the following requirements: as the formation of FTA, benefit levels of member countries in the area shall be raised, and that in countries outside the area shall not be reduced at the same time, in this way, between the FTA and MTS, the requirements of incentive

compatibility constraints are met.

Proposition 3 When $t_1=t_2=t_3$, that is, the three countries are symmetrical, and FTA constituted by 1, 2 and 2, 3 are independent mutually, external tariff will decline; when the Kemp-Ann condition is met, benefit level in the area will be improved, and that in countries outside the area will not be decreased.

$$\frac{\partial u^*(.)}{\partial t^*} \geq 0$$

$$\frac{\partial u^*(.)}{\partial t} \leq 0$$

$$\frac{\mathrm{d}\tau}{1+\tau} \Big/ \mathrm{d}\phi = 0 = [\frac{1}{1+(1+\mathrm{t})^{\delta}}]\frac{dt}{1+t} \quad \text{(Kemp-Wan tariff adjustment)}$$

Proposition 4 When $t_1=t_2=t_3$, that is, the three countries are symmetrical, in the overlapping free trade agreement constituted by 1, 2 and 3, 2 is the hub country, while 1 and 3 are spoke countries; when the external tariff levels of 1 and 3 are lowered to the degree at which regional benefit level and that outside the area will not be reduced, between the FTA and MTS, the requirements of incentive compatibility constraints are met.

Comparing with simple free trade agreement, it is easier for overlapping free trade agreement to meet the requirement of incentive compatibility conditions in the relationship with MTS due to the following reasons. First, production categories covered by modern regional trade agreement are greatly increased, and agreement parties almost transfer all the trade rights. This reduces transaction cost between enterprises. It is a key question whether regional trade agreement include "all substantive" trade merchandises. Some scholars say, "All substantive" not only refers to trade merchandises that actually exist, but also includes content of six-digit tariff lines in the coordinate system. Until recently, extensive product categories are covered by modern trade agreement, most of which includes bank, insurance, transportation, investment, intellectual property, technical barriers, etc. In 1998, WTO examined the free trade agreements established after 1990, and found that there were 43 agreements that include 100% industrial products and some optional agricultural products. Economists Scove Moris and Alan Venter hold the opinion that after 10 years'operation, a regional trade agreement shall cover 95% trade merchandises; after 15 years'operation, the coverage rate shall be increased to 98% . According to this assumption, some sensitive merchandise will be listed into regional trade agreement gradually. If WTO Doha Talks can finally conclude some substantive agreements on agricultural product, regional trade agreement in the future will also include trade of agricultural product. The appearance of overlapping free trade agreement enables the spoke countries to establish potential economic connections with other spoke countries through the hub country in wide area, and finally promote spoke countries to establish FTA and become a more open system. Next, range of policies covered by modern regional trade agreement is not only limited to the field of trade policies, participants also reach agreement on some policies related to trade. In traditional regional trade agreement, member countries mainly sign agreement in aspects of lowering tariff and eliminating quotas. However, in modern regional trade agreement, policies covered by agreement have already involved the ones related to trade. For example, all free trade agreements in North American FTA and the ones with the participation of European Union involve trade & competition policy, trade & investment policy, trade & environment policy, trade & labor policy, etc. These policies are also new issues for discussion in WTO Doha Talks. Besides, there is also an important development in the aspect of policies covered; many regional trade agreements such as European Union and European Free Trade Agreements, Australia–New Zealand Free Trade Agreement, Canada–Chile Free Trade Agreement, etc. have already began to use special protective program to replace antidumping policy between partner countries. Higher degree of openness and freedom in the area enables the overlapping FTA to further economic communication more easily, increasing dependency among Hub-and-Spoke-other Spokes, increasing the amalgamation, as well as promoting escalation of regional economic organizations, thus it is favorable to the development of MTS. Therefore, extensiveness of modern free trade agreement coverage and increase of utilized tools will promote the development of overlapping FTA toward multilateral FTA.

Overlapping free trade agreement makes all the member countries hope to be the hub country, leading to "Domino Effect" and the appearance of more overlapping free trade agreements. Examples are: establishment of FTR in the Americas, European Agreement 2004, establishment of FTA in APEC by developed countries in 2010, and establishment of FTA by developing countries in APEC in 2020. Establishment of these large FTAs involve lots of overlapping free agreements; great countries in the area represent, in multilateral trade negotiations, the interest and will of a great number of spoke countries, and participants in such negotiations are comparatively reduced, but the phenomenon of conspiracy is serious, thus agreement can not be easily reached . Therefore, to make a mutually complementary relationship between free trade agreement and multilateral, consistence of regional free trade agreement with multilateral trade agreement shall achieved as much as possible, and threat of benefit groups toward MTS in the

area shall be eliminated by means of gradually eliminating rules of origin.

4. Conclusion

This thesis takes the special phenomenon--overlapping free trade agreement in the development of FTA emerged after the 1990s as object of study, adopting the analyzing method of repeated games to study the tariff preference and self–execution of overlapping free trade agreement, as well as problems such as its incentive compatibility toward MTS. It is pointed out in the thesis that in the overlapping FTA, hub country has preference to high tariff for countries outside the area due to its special position; in order to make up for their inferior positions, spoke countries need to bring external tariff down. Due to the complexity of rules of origin in overlapping FTA, protection of the area toward the outside is relatively high, thus losses suffered for violation to cooperation agreement will be relatively heavy, and therefore overlapping free trade agreement possesses the nature of self–execution. In Kemp-Ann tariff adjustment conditions, compatibility relationship of Customs Union and MTS is pointed out; overlapping free trade will affect kemp-Ann conditions due to the scale of trade, discrepancy in comparative advantage and special arrangement of hub country and spoke countries, provided that member countries are symmetrical and their external tariffs are consistent. However, one thing is sure: in overlapping free trade agreement, external tariff levels of spoke countries shall be brought down properly until countries outside the area will not change their trade directions because of the position difference between hub countries and spoke countries, and then the optimal external tariff levels of spoke countries can be reached. Only in this way could the compatibility between overlapping free trade agreement and multilateral trade agreement be guaranteed.

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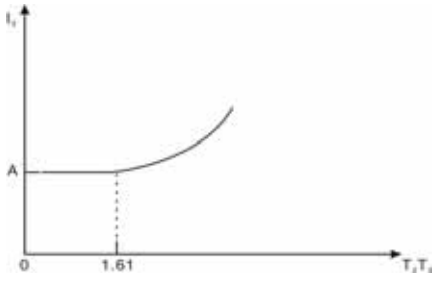

Figure 1. Analysis of cohesive effect of industry

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Socio-Economic Status and Parental Savings for Higher Education among Malaysian Bumiputera Families

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Abstract

Socioeconomic status of a family is a benchmark for a student in Malaysia to get financial aid in education, on top of their academic performance. As the number of students obtaining good grades in their Sijil Pelajaran Malaysia examination increases, entry to public universities become more competitive and the chances to get a full education financing become smaller. Most students resort to loans provided by PTPTN as many still do not have any form of saving to finance their higher education. This study attempts to explore on parental saving for children's higher education among Bumiputera across different socio-economic groups. A survey was conducted in UiTM and six of its affiliated colleges, with the total respondents of 371. Questionnaires to parents were distributed through the students. The results of the study reveal that only 15% of the students sampled received a form of financial aid from the government. The findings also show high correlation between the socio-economic status of parents and the level of awareness towards saving for their children. The findings are hoped to create awareness in the society that saving incentives for higher education can be utilized by all low and middle-income families in all communities.

Keywords: Socio-economic, Parental saving, Financial aid

1. Introduction

An increasing worldwide challenge for individuals and families with children is the cost of higher education. Attainment of a college degree is desirable given its high positive correlation with lifetime earnings. Most parents consider the funding of their children's higher education as one of their most important family financial goals. In Malaysia, children are still very much dependent on their parents to finance their higher education. Paying for a college education had traditionally been seen as primarily a family obligation, being met through some combinations of current earnings, savings and borrowing.

For many decades, the Malaysian government, via its agencies like PSD and MARA, has provided scholarships to high achieving students to help finance their college education. However, limited public funding and the issue of private social benefits of higher education have forced the government to resort to alternative methods of financing higher education such as educational loans. This is evident from the development of the National Higher Education Fund Corporation (PTPTN) and the National Education Savings Scheme (SSPN) in 1997. SSPN is specially designed to encourage parents to save for the purpose of their children's higher education in the future. Parental saving in this educational scheme can be treated either as a substitute or a complement to government loans and other forms of educational financial aids.

Family socioeconomic status has since become a benchmark in awarding the financial aid, on top of student's academic achievement. As the number of students obtaining good grades in their Sijil Pelajaran Malaysia (SPM) examination increases, entry to public universities become more competitive and the chances to get a full education financing become smaller. Many students resort to loans provided by PTPTN as most do not have savings to finance their higher education. Students nowadays are obligated to be financially independent when they pursue their higher education. This leads to another social issue: graduate with debts.

There is little previous empirical work on parental saving for higher education. However, the few researches have shown that the amount saved for children's education was related to parent's income and attitudes regarding saving (Hossler and Vesper, 1993; Chang, 1995 and Churaman, 1992). Parental saving behavior appeared to be a significant

determinant of the parent contribution to their children's higher education costs. Lee (1997) found that the education level of the mother was also related to having education saving as a goal.

Hossler and Vesper (1993) had grouped the determinants to parental saving to three clusters: background characteristics, student and parental aspirations and activities, and information and incentives. Background characteristics included family income, family size, gender, race, parental education, and student ability. The student and parental aspirations and activities included their attitudes and values. The information and incentives cluster are related to parental knowledge of higher education costs and student financial aid. Hossler, Braxton and Coopersmith (1990) in their review of research on student college choice concluded that parental education is positively associated with the post-secondary educational aspirations of their children.

Case and McPherson (1987) observed that parents may not act rationally when it comes to saving for higher education because they lack knowledge about financial aid and fail to anticipate the fill costs of higher education.This study utilizes a few variables in the Hossler-Vesper clusters to group parents in different socio-economic groups and investigates the relationship with parental saving.

This paper attempts to re-look at the traditional role of parents in providing the financial support for their children's higher education. Specifically, it will try to investigate the current state of parental saving among the Bumiputera families. The results should shed some light on the issue discussed earlier.

2. Methodology

2.1 Data and sample

The study was conducted at Universiti Teknologi MARA (UiTM), Shah Alam and six of its affiliated colleges: Institut Professional Baitulmal, Institut Teknologi Perak, Kolej UNIKOP, Kolej Yayasan Terengganu, Kolej Shahputra and Kolej Teknologi Timur. A total of 371 parents of students at these institutions took part in the survey.

2.2 Instrument and Variables

A questionnaire was used in the survey and the survey was done in the same semester. Students were from different programs (to capture both arts and science groups) and different levels. Convenient sampling method was adopted. The actual respondents were their parents. The socio-economic status (SES) is derived using four variables: father's income, father's occupation, father's highest education level, and mother's highest education variable. SES 1 stands for 'high SES', SES 2 stands for 'high-medium SES', SES 3 stands for 'low-medium SES' and SES 4 stands for 'low SES'.

3. Results and discussion

The socioeconomic composition of the sample is shown in Table 1. The highest number of respondents came from the lower middle socioeconomic group followed by the higher middle. The lowest socioeconomic group seemed to be under-represented.

<< Table 1: The socio-economic composition of respondents>>

Table 2 shows parents' perception of their children's higher education costs across the four socioeconomic groups. About 77% of parents from the lowest socioeconomic group and felt that the costs were expensive compared to 64% of parents from the highest socioeconomic group who felt that they were reasonable.

<<Table 2: Parents' perception of higher education costs by socio-economic group>>

In financing their higher education, 15% of the students received government financial aid, 45% took up PTPTN loans, 7% took loans from banks and private bodies while 32% reported to have some form of savings by their parents. Though not very high, the number was quite impressive for a developing country like Malaysia.

Table 3 shows the amount that parents were willing to pay for their children's higher education. Obviously parents from the high socioeconomic group were willing to pay higher amount with RM15,000 reported to be the maximum amount. As for the lowest socioeconomic group, the maximum amount that they were willing to pay was RM5000.

<<Table 3: Willingness to pay for higher education by socio-economic group>>

About 49% of the sample was aware of the costs that they have to bear for their children's higher education and had educational fund for their children. Majority chose to park this fund in savings accounts, followed by insurance, Tabung Haji and fixed deposit accounts. A few had saving in the form of assets.

Parents who did not save cited the following reasons: they were not aware of the total costs that they had to bear (45%), had to save for other circumstances like healthcare and housing (24%), high current expenditure on school matters (19%) and had no excess income to be saved (12%). Some felt that financing higher education expenses should be the responsibility of the government.

In many cases, parents of children in private colleges were the one unprepared with the high costs. If the information on total costs were made known and easily available, most parents agreed that they would save much more and much

earlier. On the other hand, they also agreed that they might also spend more on private tuition for their children during secondary school years to ensure good SPM grades so that their children could be accepted into public universities that charged lower costs.

The monthly allocations of parental saving across different socioeconomic groups are shown in Table 4. Most parents allocated between RM10 to RM300 for their children's higher education. A few from the high socioeconomic group managed to put aside more than RM1000 per month.

<<Table 4: Monthly allocation of parental saving by socio-economic group>>

When asked about SSPN, 60% of the respondents said they were aware of the scheme while 40% were not. Out of those who knew about SSPN, only 11% had joined the scheme. Table 5 shows the number of parents who were aware of the saving scheme and who might consider joining it across the four socioeconomic groups.

<<Table 5: The number of parents who were aware and interested to join SSPN by socio-economic group>>

SSPN was not perceived as an attractive saving scheme by most parents, especially those from the high socioeconomic group. This was due to the lack of information pertaining to its returns and benefits. Compared to conventional saving and insurance, the administration process was perceived as not so convenient.

4. Conclusion

Parental saving for higher education among the Bumiputera still have a long way to go. Despite people's awareness of the importance of higher education, many are still not financially prepared. This is mostly due to the ignorance of the actual costs of higher education, especially in private institutions. Many still assume and hope to enter public universities, like UiTM, that charge lower fees.

The amount of parental saving is found to be highly correlated with the socioeconomic status of the family. This could be due to their ability to save and their accessibility to information pertaining to higher education costs. On the other hand, the low socioeconomic group might face constraints in the opportunity to save. The equal grant match in the SSPN scheme will benefit this group the most and efforts must be taken to encourage them to join the scheme.

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Table 1. The socio-economic composition of respondents

Socio-economic status	Percentage represented in sample
1	11.2
2	21.1
3	57.1
4	10.5

Table 2. Parents' perception of higher education costs by socio-economic group

Perception on higher education costs	SES 1 (%)	SES 2 (%)	SES 3 (%)	SES 4 (%)
Cheap	12	2	0.6	0
Reasonable	64	56	35	23
Quite Expensive	24	42	64	77

Table 3. Willingness to pay for higher education by socio-economic group

WTP on Higher Education (RM)	SES 1 (%)	SES 2 (%)	SES 3 (%)	SES 4 (%)
50-1000	3	17	22	32
1001-3000	19	35	32	44
3001-5000	29	22	32	20
5001-8000	6	11	6	4
8001-10,000	19	9	7	0
> 10,000	2	6	1	0

Table 4. Monthly allocation of parental saving by socio-economic group

Monthly allocation (RM)	SES 1 (%)	SES 2 (%)	SES 3 (%)	SES 4 (%)
10-100	40	36	46	67
101-300	27	45	40	33
301-500	0	14	10	0
501-1000	13	5	4	0
> 1000	20	0	0	0

Table 5. The number of parents who were aware and interested to join SSPN by socio-economic group

	Aware of SSPN	Will probably join SSPN
SES 1	15	1
SES 2	44	5
SES 3	105	11
SES 4	17	2

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Accuracy and Conservatism of VaR Models: A Wavelet Decomposed VaR Approach Versus Standard ARMA-GARCH Method

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Abstract

With increasing internationalization of financial transactions, the foreign exchange market has been profoundly transformed and became more competitive and volatile. This places the accurate and reliable measurement of market risks in a crucial position for both investment decision and hedging strategy designs. This paper deals with the measurement of risks from a Value at Risk (VaR) perspective. A Wavelet-ARMA-GARCH refinement method to VaR estimate is used and compared with classical ARMA-GARCH approach. Performances of both approaches have been tested and compared using Kupiec backtesting procedures.

Experiment results suggest that the performance of Wavelet-ARMA-GARCH refinement method to VaR estimate improves the reliability of VaR estimates at all confidence levels which offers considerable flexibility and potential performance improvement for Foreign exchange dealers.

Furthermore, the appropriate selection and combination of parameters can lead to comprehensive performance improvement in reliability.

Keywords: Value-at-Risk, Foreign exchange rate, ARMA-GARCH, Wavelet, Wavelet Decomposed VAR, Kupiec Backtesting procedures

1. Introduction

The foreign exchange market plays an indispensable role in providing the essential machinery for making payments across borders, transferring funds and purchasing power from one currency to another, and determining the singularly important price, the exchange rate. Since the early 1970s, with increasing internationalization of financial transactions, the foreign exchange market has been profoundly transformed, not only in size, but in coverage, architecture, and mode of operation. The foreign exchange business is naturally risky, because it deals primarily in risk-measuring, pricing, accepting when appropriate, and managing it. The success of a bank or other institution trading in the foreign exchange market depends critically on how well it assesses, prices, and manages risk, and on its ability to limit losses from particular transactions and to keep its overall exposure controlled.

Market risk is simply price risk or exposure to price change. Various mechanisms are used to control it, and each institution has its own system. At the most basic trading room level, banks have long maintained clearly established volume or position limits on the maximum open position that each trader or group can carry overnight, with separate-probably less restrictive-intraday or daylight limits on the maximum open position that can be taken during the course of a trading session.

Market participants need a more dynamic way of time evolving assessing market risk, rather than measuring risk on the basis of a snapshot as of one particular moment, or by looking at the estimated amounts of funds involved. Industry members recommended a series of actions to assist in the measurement of market risk. They recommended that

institutions adopt a value at risk (VaR) measure of market risk, a technique that can be applied to foreign exchange and to other products. It is used to assess both the market risk of the foreign exchange position of the trading room, and the broader market risk inherent in the foreign exchange position resulting from the totality of the bank or firm's activities. VaR is a statistical number describing the potential downside risk over a given holding period at a certain confidence level. Numerous techniques evolve to extract information from data and estimate accurate and reliable VaR number.

In this paper we focus on the wavelet analysis to VaR estimate for Foreign Exchange market. Experiments using daily time series of CAND/USD, JPY/USD, SZF/USD and SFR/USD exchange rate returns are conducted to statistically evaluate the performance of the Wavelet and the more standard ARMA-GARCH approaches to VaR estimates. Although this method (the Wavelet analysis) is gradually gaining momentum in financial time series forecasting, it has received little attention in the risk management field. More comprehensive researches are needed to investigate what wavelet analysis can achieve for VaR estimates and analysis. There have been some attempts to apply wavelet analysis to VaR estimates, but their focus is on investigating the distribution of potential market losses embedded in VaR numbers across the time horizons. Their approach is based on the assumption that wavelet decomposed variances at different scales represent investors' preferences. However, they seem to have ignored the impact of different wavelet families chosen for analysis, which leaves their findings largely inconclusive (Chen, S.et al., 2006). For that reason three families of wavelets and two decomposition levels are used in this paper to investigate the effect of changing of wavelet families and decomposition level on the model's performance.

Although experimenting is an important step in research, concluding statements can only be made after a thorough process of validation. Therefore Experiment results are backtested and compared using Kupiec Backtesting procedures to evaluate their accuracy and reliability.

The goal of this paper is therefore to check whether Wavelet-ARMA-GARCH VaR model performs adequately than the standard ARMA-GARCH VaR model and to see the effect of changing of wavelet families and decomposition level on the model's performance.

The rest of the paper is set out as follows: Section 2 deals with literature review. We present Value at Risk, then the wavelet theory and its application in finance and economy and finally the Wavelet-ARMA-GARCH refinement Method or the Wavelet Decomposed VaR (WDVaR) as a specific application of wavelet analysis to VaR estimates. Section 3 presents the empirical analysis: we estimate foreign exchange rate VaR using the ARMA-GARCH standard scheme and the proposed Wavelet methodology. Performances of both approaches have been tested and compared using Kupiec backtesting procedures. Moreover, three families of wavelets are used: the Db4, the Haar and the Sym6. The forth section concludes.

2. Literature review

2.1 Value at Risk (VaR)

VaR estimates the potential loss from market risk across an entire portfolio, using probability concepts by identifying the portfolio containing fundamental risks, allowing an underlying quantifiable and manageable risk factors decomposition of this latter.

Standard VaR estimates take the mathematical form as in (1), which means "we are X percent certain that we will not lose more than r_{VaR} of my investment in the next t days under normal market conditions (Jorion, P., 2000):

$$p\{L(0) - L(t) \le -r_{VaR}\} = 1 - \alpha \qquad (1)$$

Where $L(\bullet)$ denotes the value of the portfolio at time t, α is the confidence level.

Several methods for VaR estimation have mainly been tried through the following three approaches:

The parametric approach, also called variance-covariance approach is more popular than its more complex and sophisticated non-parametric counterpart, the simulation approach. This approach, implemented as either historical simulation or Monte Carlo simulation, is computationally demanding and very costly as well. When the approach is parametric, it is based on the assumption that returns are distributed normally. The parametric approach is flexible, easy to understand and widely accepted (Winer 1997). However, it relies heavily on the assumption of a normal returns distribution. This assumption can be wrong in case when the distribution is "fat-tailed": the frequency of exceptions occurring is higher than when the distribution is assumed to be normal (Hull 2000).

The non parametric approach lets the data speak for it self and extends historical patterns hidden in the data into future. Semi parametric emerges recently to strike the balance between the two extremes, where different techniques borrowed from other disciplines, such as engineering, computer science, applied mathematics, etc., made their way into the field of finance. These may include methods such as Extreme Value Theory, Wavelet Transformation, Fuzzy Logic, etc.

2.2 VaR Models validation: the Kupiec backtesting procedures

VaR models are useful in one way only: if they predict the risk well. Model validation is the process of checking whether a model performs adequately, which can be done by a set of tools. One of these tools is backtesting. Backtesting is a tool which verifies whether projected losses are in line with actual losses, in the form of a statistical framework (Jorion 1996). This entails systematically comparing the history of VaR forecasts with the corresponding portfolio returns. For VaR users and risk managers, these checks are essential for examining whether their model is well calibrated. If not, the model needs to be reexamined, in terms of parameters, assumptions and ways of modelling. The theory and corresponding models regarding backtesting, are derived from Jorion (1996) and Hull (2000).

An observation is a moment where the actual return over an horizon of h days is compared with the forecasted VaR number for this same horizon. The number of observations exceeding the VaR is also known as the number of exceptions. With too many exceptions, the model underestimates the risk. With too few exceptions, the model is in fact conservative, leading to an inefficient allocation of capital.

As already mentioned, backtesting involves systematically comparing the history of VaR forecasts, with the actual, subsequent returns. With perfectly calibrated model, the number of exceptions should be in line with the confidence level. With a 95% confidence level, one expects 5% exceptions. At some point, there must be a decision made to accept or reject the current model. The decision can be made based on the results of a statistical test.

One way to verify the accuracy of the model is to examine the failure rate of the model.

The failure rate is the proportion of times the VaR figure is exceeded in a given sample. As at a given moment, a VaR number is specified given a certain confidence level c for a total of T observations, N is defined as the number of exceptions - i.e. the number of observations where the actual loss exceeds the VaR - and NT is the failure rate (Jorion 1996).

Among various hypothesis based backtesting procedure available, the one proposed by Kupiec in 1995 is the simplest and the most popular and available. It is based on the simple notion that the model validation process can be treated as a series of Bernouilli trials testing sequences of success and failure. VaR exceedance N in large sample T should converge to the binomial distribution. The likelihood ratio statistics is developed by Kupiec as in (2) for testing the specific confidence intervals.

$$LR_{uc} = -2\log\left[(1-p)^{T-N} p^{N}\right] + 2\log\left\{\left[1-(N/T)\right]^{T-N}(N/T)^{N}\right\} \quad (2)$$

Where LR_{uc} denotes the test statistics that has on asymptotic $\chi^2(1)$ distribution. T is the total number of observations that are used in test set. p is the probability of an VaR exceedance occurrence.

2.3 Wavelet analysis and its application in economics and finance

2.3.1 wavelet analysis development

Wavelet analysis is a relatively new tool in the field of applied mathematics. Daubechies (1992), Chui (1992) and Graps (1995) provide the fundamentals of the wavelet theory. Wavelet analysis provides the opportunity to make semi-parametric estimations of highly complex structures without knowing the underlying functional form.

Wavelet analysis, in contrast to Fourier analysis, gives insight in local behavior, whereas Fourier analysis gives insight in global behavior. The Fourier transforming processes time-series by transforming the signal from the time domain into the frequency domain. The new processed signal provides insight in the amount of frequencies and the amount of energy in each frequency existing in this time-series. However, local effects are only visible in the time domain and not in the frequency domain. Wavelet analysis makes use of a fully scalable window, which is shifted along the signal in order to capture local behavior in the time domain. This process is repeated several times with different window-sizes, with a collection of time-frequency representations of the signal as a result. The transformation of the signal into the several resulting wavelet coefficients, each provides information at different scales, is more often referred to as time-scale decomposition. However, as there is no direct connection between the Fourier frequency parameter and the Wavelet parameter, the term scale is preserved for wavelet analysis, whereas the term frequency is preserved for Fourier analysis.

Wavelet analysis utilizes the wavelet basis function $\psi(t)$, or commonly referred to as wavelets in the literature for brevity, to transform the original data. Wavelet can be described as a function of time t that exhibits certain appealing properties beyond those offered by 'big waves' functions including sins and cosines.

Mathematically wavelets are defined as functions that satisfy admissibility condition as in (3)

$$C_{\psi} = \int_0^{\infty} \left|\varphi(f)\right| / f df \prec \infty \quad (3)$$

Where $\varphi(f)$ is the Fourier transform of wavelet. $\Psi(t)$ in the frequency domain.

There are different families of wavelets available. Each of them is capable of adapting to and accentuating certain data characteristics. Typical wavelets include Haar wavelet, Daubechies wavelet, Symlets wavelet, Coiflets wavelet, ect.(Genacay,R,F.Selcuk,and B.Whitcher).

Using wavelets functions, we can perform wavelet transform on the signal $x(t)$. The transformation is conducted as in (4).

$$W(u,s) = \int_{-\infty}^{\infty} x(t)\psi_{u,s}(t)dt \qquad (4)$$

Where $\psi_{u,s}(t) = 1/\sqrt{s}\Psi(t-u/s)$, u is the wavelet parameter translating the original wavelet function, s is the scale parameter dilating the original wavelet function.

Wavelets transform analyzes and decomposes the original time series x(t) into series at different scales. Reconstruction of the original return series from decomposed wavelet coefficients could be performed as in (5) accordingly if the admissibility condition is satisfied.

$$x(t) = 1/C_{\Psi} \int_{0}^{+\infty} \int_{-\infty}^{+\infty} W(u,s)\Psi_{u,s}(t)du\,ds/s^2 \qquad (5)$$

2.3.2 Wavelet in finance and economics

Ramsey (1999) gives an overview of the contribution of wavelets to the analysis of economic and financial data. The ability to represent highly complex structures without knowing the underlying functional form proved to be a great benefit for the analysis of these time-series. In addition, wavelets facilitate the precise location of discontinuities and the isolation of shocks. Furthermore, the process of smoothing found in the time-scale decomposition facilitates the reduction of noise in the original signal, by first decomposing the signal into the wavelet components, then eliminating all values with a magnitude below a certain threshold and finally reconstructing the original signal with the inverse wavelet transform (Walker 2000). Stevenson (2000), for example, used wavelet analysis for the filtering of spot electricity prices in the deregulated Australian electricity market. By examining both the demand and price series at different time locations and levels of resolution, Stevenson was able to reveal what was signal and what was noise. Ramsey and Lampart (1998) used wavelet analysis for time-scale decomposition. They researched both the relationships between consumption and income and money and GDP. The time-scale decomposition yielded a new transformed signal built up from the several wavelet coefficients representing the several scales. At each scale, a regression was made between the two variables. Chew (2001) researched the relationship between money and income, using the same technique of wavelet-based time-scale decomposition as Ramsey and Lampart (1998) did. This research yielded a greater insight in the money versus income nexus in Germany. Arino (1996) used wavelet-based time-scale decomposition for forecasting applications. The approach used was to apply forecasting methods on each of the resulted coefficients from the time-scale decomposition. After applying forecast methods on each of these coefficients, the final forecast of the complete series was obtained by adding up the individual forecasts.

Aussem and Murtagh (1997) used neural networks to examine the individual coefficients. The trained neural network with its approximated variables in the target function was used for the final forecast. In the area of finance, multi-resolution analysis appears useful, as different traders view the market with different time resolutions, for example hourly, daily, weekly or monthly. The shorter the time-period, the higher the frequency is. Different types of traders create the multi-scale dynamics of time-series.

Struzik (2001) applied the wavelet-based effective Holder exponent to examine the correlation level of the Standard & Poor's index locally at arbitrary positions and resolutions (time and scale).

Norsworty et al. (2000) applied wavelets to analyze the relationship between the return on an asset and the return on the market portfolio, or investment alternative. Similar to other researches in the field of finance and economics, they applied wavelet-based time-scale decomposition to investigate whether there are changes in behavior for different frequencies. The research indicated that the effect of the market return on an individual asset's return will be greater in the higher frequencies than in the lower.

2.4 Wavelet Decomposed VaR theory

In recent years, more rigid statistical test frameworks and researches have suggested that further performance improvement can not be achieved with the single model approach alone since data exhibit complex behavior that combine the characteristics of heteroscedasticity, leptokurtosis, long memory and even chaos. Thus, as the demand for estimation accuracy moves on to a new level, forecasting community increasingly looks for help from new modeling approaches. A first one is the linear combination approach, which combines the forecasting powers of different models, is intuitively straightforward and easy to implement. However, it is based on the assumption of individual model capability to strictly separate out data features of interest and the non interference of such models. This assumption is so strong that two issues stand out in practice. Firstly, the fitting and estimation of model parameters is distorted for ill

behaved data. Secondly, the first model during the fitting process occupies a privileged position and may destroy data features that the second model is meant to capture.

To tackle the second issue, the nonlinear ensemble approach is introduced. Each individual model is fitted to the data separately, to avoid distortions. Then artificial intelligence algorithms such as neural network and genetic algorithm are employed as combination mechanisms to find out the time varying weights that the data features captured by each individual model contribute to the evolution of the entire series. However, despite its recent popularity in the hybrid modeling community, due to its inherent black box approach, it can offer only limited insights into the underlying driving factors evolution for complicated time series (In, F. and Kim, S., 2005).

The previous approaches can all be categorized as ex-post continuous filtering or processing of time series data. The success of the operation of these methods depends on the assumption that each filter is capable of fully extracting the features it was designed to capture. But since noisy and ill-behaved data in practice frequently violate the assumptions of these models, significant bias results during the forecasting process and further performance improvement would critically depend on the accuracy of the individual forecasters. If excessively large biases exist during individual forecasting processes, impact of artificial intelligence techniques used to achieve maximum sample estimation accuracy wouldn't be adequate, the model would perform poorly out of sample. (Chen, S.et al., 2006)

Traditionally various models have been attempted to describe the complex risk evolution process. They aim to capture particular data characteristics. This result in the quick deterioration of model's performance once they are outside the problem domain being investigated.

Although a handful of statistical tests have been utilized to help in identifying the existence of particular data characteristics, these tests usually lack sufficient discriminatory power for noisy data and may not cover all the data features under investigation. Thus, semi-parametric approaches have received considerable attentions recently introducing Wavelet Decomposed techniques as a promising direction for risk estimate (Chen, S.et al., 2006).

The implementation of the method is laid down as follows:

When the data distribution can be characterized using the first and second moment, the VaR is estimated following (6)

$$VaR = F(a)\hat{\sigma}_{t+1/t} - \hat{\mu} \tag{6}$$

Where $F(a)$ refers to the corresponding quantile (95th, 97.5th or 99th) of the assumed distribution. $\hat{\sigma}_{t+1/t}$ refers to the forecast of conditional standard deviation at time t+1 given information at time t. $\hat{\mu}$ refers to the forecast of sample mean.

Therefore, the estimation of VaR boils down to the estimation of conditional mean and conditional volatility which involves four steps:

1. by applying wavelet transformation to return series data, the original data are decomposed into sub return series data at different scales j as in (7):

$$f(t) = f_{A^j}(t) + \sum_{j=1}^{J} f_{D^j}(t) \tag{7}$$

Where f (t) is the original signal. $f_{A_j}(t)$ is the decomposed time series data by applying scaling function at scale j. $f_{D_j}(t)$ is the decomposed time series data by applying wavelet function at scale j. A^j is in the literature often referred to as the level-j approximation of the original signal, whereas D^j is often referred to as the level-j detail of the original signal.

2. The VaR estimated to cover portfolio losses is then expected to cover losses at each individual scales as in (8):

$$VaR = VaR_{A^j} + \sum_{j=1}^{J} VaR_{D^j} \tag{8}$$

Expanding (6) into (8)

$$VaR = F(a)\hat{\sigma}_{t+1/t,A^j} + \hat{\mu}_{A^j} - \sum_{j=1}^{J} (F(a)\hat{\sigma}_{t+1/t,D^j} + \hat{\mu}_{D^j}) \tag{9}$$

3. Estimation of conditional mean is made by fitting ARMA model to the training set which is used to estimate the model parameters. The estimated model is then used to make the out-of-sample forecast, one day in advance. This is given in (10).

$$\hat{\mu} = \frac{1}{n}\sum f(t) = \frac{1}{n}\sum f_{A^j}(t) + \sum_{j=1}^{J}\frac{1}{n}\sum f_{D^j}(t) = \hat{\mu}_{A^j} + \sum_{j=1}^{J}\hat{\mu}_{D^j} \tag{10}$$

4. The conditional volatility is modeled as a mixture of GARCH (1, 1) processes at each scale. This is also given in (11).

GARCH (1, 1) is used to fit each individual data series, estimate specific coefficients, and make one step ahead forecasts. Then variances for return series are reconstructed from coefficient variances at the individual level by following one of the special properties of wavelet analysis called preservation of energy, i.e. the variances are preserved across time-scale domain during wavelet decomposition.

$$\hat{\sigma} = \text{var}(f(t)) = \text{var}(f_{A^j}(t)) + \sum_{j=1}^{J}\text{var}(f_{D^j}(t)) = \hat{\sigma}_{t+1/t,A^j} + \sum_{j=1}^{J}\hat{\sigma}_{t+1/t,D^j} \tag{11}$$

3. Empirical Analysis

In this section we present the data set, the descriptive statistics, forecast performance results and the interpretations of experiments results.

Presentation of data

The data set used here consists of four daily average quoted rates on American exchange market against the American Dollar: CAD/USD, JPY/USD, SZF/USD and SFR/USD. Our choice of data is justified by the fact that the dollar is by far the most widely traded currency. According to the 1998 survey, the dollar was one of the two currencies involved in an estimated 87 percent of global foreign exchange transactions, equal to about $1.3 trillion a day. In part, the widespread use of the dollar reflects its substantial international role as: "investment" currency in many capital markets, "reserve" currency held by many central banks, "transaction" currency in many international commodity markets, "invoice" currency in many contracts, and "intervention" currency employed by monetary authorities in market operations to influence their own exchange rates. The other currencies represent 4 countries witch are respectively: Canada, Japan, Switzerland and South Africa. They are almost representing different continents.

It consists of a daily data from January 1971 to December 2002. 60% of the data set serves as the training set, while the 40% is used as the test set. One step ahead out of sample forecast is conducted to evaluate the accuracy and reliability of various models under investigations. The original observations are log differenced (i.e. $\log(x_t) - \log(x_{t-1})$) for further processing and modeling attempts.

Figures 1, 2, 3 and 4 display the time series of CAD/USD, JPY/USD, SFR/USD and SZF/USD exchange returns from January 1971 to December 1989.

According to these figures, we observe that the average of exchange rates appears constant and no change in the average is observable. We also notice the presence of periodic clusters of the volatility, in particular large variations have the tendency to be followed by high variations of having variable signs and periods of tranquility alternate with periods of elevated volatility. For the CAD/USD, and SZF/USD we notice more steep changes than JPY/USD and SFR/USD. We will perfect these remarks by the survey of the statistical properties of series of exchange rates returns.

Descriptive statistics and hypothesis testing

Table 1 summarizes the descriptive statistics for the exchanges rates returns along the whole period. We remark that these facts suggest a highly competitive and volatile market which makes adequate risk management and control necessary. Firstly, there are significant price fluctuations in the markets as suggested by positive standard deviations. The substantial difference between the minimum and maximum level also indicates considerable losses, as foreign exchange dealers could face large gains as well as huge losses if risks are not properly measured and managed.

Secondly, we can remark that there is a higher probability of losses in the second and the fourth market as indicated by the negative Skewness.

Thirdly, the high level of excess kurtosis ranging from 3.78416 to 73.74597 suggests that the markets are volatile, with high probability of extreme events occurrences.

The nonlinear and volatile nature of the foreign exchange markets are further confirmed by formal statistical tests conducted. The rejection of Jarque-Bera test of normality suggests that the returns deviate from normal distribution significantly and exhibit leptokurtic behaviors.

Forecast performance results

For hypothesis testing approach, the null hypothesis suggests that the VaR models exhibit statistical properties that are characteristics of accurate VaR estimate. The test statistics is calculated and compared to critical values corresponding to certain confidence level to decide whether or not to reject the model at that confidence level.

Backtesting results for ARMA-GARCH-VaR

The order is set to 1 for GARCH model since empirical researches suggest that GARCH (1, 1) suffices for most of the situations. The order is set to 1 for ARMA process. For 1 day horizon, the complete set of daily volatilities is generated by using GARCH (1, 1). VaR values are forecasted on the basis of the estimated volatilities.

As suggested by experiment results in table 2, ARMA(1,1)-GARCH(1,1) performs rather well and is accepted under all circumstances. The performance of ARMA(1,1)-GARCH(1,1) gradually deteriorates under higher confidence levels for all markets. ARMA(1,1)-GARCH(1,1) provides much better coverage of risks under lower confidence level. This implies that ARMA(1,1)-GARCH(1,1) model may underestimate risk measurement and serve as a generally aggressive risk measures.

The high level of acceptance of ARMA-GARCH VaR supports and confirms the popularity of linear combining power of ARMA and GARCH models during the estimation process. However, increasing competition in the markets pushes operators to work on slight margins, implying that additional accuracy and flexibility have to be pursued.

Backtesting results for WDVaR (Haar, 2)

Two new parameters are introduced during estimations. The first is the wavelet family chosen to decompose the original return series. The second is the decomposition level. The decomposition level is set to 2 and Haar wavelet is chosen as the first wavelet family to decompose the original return series.

As shown by experiment results in table 3, WDVaR (Haar, 2) is now accepted at about all confidence levels for four markets, whereas it failed in the 95% confidence level in SFR/USD. We can see also that WDVaR (Haar, 2) shows inferior performance compared to ARMA-GARCH, i.e. the p values are lower. This finding can't be surprising but it indicates that ARMA-GARCH VaR is an overly conservative risk measure. In fact the decreasing level of p value by switching from ARMA-GARCH VaR to WDVaR is resulted by improvement in forecasting accuracy.

Moreover, this generally inferior performance of WDVaR (Haar, 2) could be caused by inappropriate setting of parameters, i.e. the wavelet family and decomposition level chosen.

Backtesting results for WDVaR (Db4, 2) and WDVaR (Sym6, 2)

Experiment results in table 4 and 5 show that compared to ARMA- GARCH, WDVaR (SYM6, 2) and WDVaR (Db4, 2) gain performance improvement (the improvement in p value) in three markets (JPY/USD, SFR/USD and SZF/USD) at all confidence levels. Thus WDVaR is less aggressive than ARMA-GARCH approach and provides better coverage of market risks. It offers more flexibility and also greater need for control.

However, the performance of WDVaR for the first foreign exchange rate does deteriorate compared to the performance of ARMA-GARCH model. i.e. The p values are lower. WDVaR (Sym6, 2) and WDVaR (Db4, 2) seem to provide more conservative coverage of market risks.

Moreover, experiments based on WDVaR (Db4, 2) and on WDVaR (Sym6, 2) are conducted at all confidence levels across to investigate the effect of changing of wavelet families on the model's performance. Experiment results show that they gain performance improvement (the improvement in p value) in all markets at all confidence levels by switching from Haar to Sym6 and DB4 wavelet families. This finding confirms that changing wavelet families improves the model's performance.

Backtesting results for WDVaR (Db4, 5)

Experiments based on WDVaR (DB4, 5) are conducted at all confidence levels across all four foreign exchange markets to investigate the effect of changing decomposition level on the model's performance.

Analysis of experiment results in table 6 indicates that changing decomposition level from 2 to 5 doesn't ameliorate model's performance in term of p-values.

In fact the performance improvement by increasing the decomposition level comes not from higher p-value, but from higher forecasting accuracy.

4. Conclusions

More recently, several ideas have been put forward for a portfolio approach to the value-at-risk approach to market risk. There have been some attempts to apply wavelet analysis to VaR estimates. Their approach is based on the assumption that wavelet decomposed variances at different scales represent investors' preferences. However, they seem to have ignored the impact of different wavelet families chosen for analysis, which leaves their findings largely inconclusive.

In this paper, experiments using daily time series of CAND/USD, JPY/USD, SFR/USD and SZF/USD exchange rate returns are conducted to statistically evaluate the performance of the Wavelet and the more standard ARMA-GARCH approaches to VaR estimates.

ARMA(1,1)-GARCH(1,1) performs rather well and is accepted under all circumstances but performance of ARMA(1,1)-GARCH(1,1) gradually deteriorates under higher confidence levels for all markets. This implies that ARMA(1,1)-GARCH(1,1) model may underestimate risk measurement and serve as a generally aggressive risk measures.

WDVaR (Haar, 2) shows inferior performance compared to ARMA-GARCH(the p values are lower). This finding indicates that ARMA-GARCH VaR is an overly conservative risk measure. Because the decreasing level of p value by switching from ARMA-GARCH VaR to WDVaR, is caused by improvement in forecasting accuracy.

In addition, the appropriate selection and combination of parameters can lead to comprehensive performance improvement in reliability (as measured by p value). In fact, based on findings from previous experiments, it is argued in this paper that WDVaR has demonstrated its capability to improve the reliability of VaR estimates at all confidence levels which offers considerable flexibility and potential performance improvement for Foreign exchange dealers.

However, a comparison with other models could be investigated and further researches can be conducted to investigate for example the effect of multi-fractal VaR models' performances especially with the specific features observed in our data.

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Table 1. Descriptive Statistics & Statistical Tests

	CAD/USD	JPY/USD	SFR/USD	SZF/USD
Mean	0.0000173011	-0.0000592292	0.00012019289	-0.0000593449
Maximum	0.0082644000	0.0271680000	0.0857000000	0.0253058653
Minimum	-0.0080960000	-0.0412790000	-0.0626000000	-0.0191450342
Standard deviation	1.417729e-06	7.854678e-06	1.298358e-05	1.008306e-05
Skewness	0.10611	-0.82078	1.19116	-0.00271
Kurtosis	3.99114	11.65273	73.74597	3.78416
Jarque-Bera	5451.86220	47262.35153	1858040.64247	4887.27396
Test (p-value)	0.00000000	0.00000000	0.00000000	0.00000000

Table 2. Experiments results for ARMA-GARCH VaR

Exchanges Rates Returns	Confidence level	ARMA-GARCH VaR Exceedances	Kupiec Test (P-value)	ARMA-GARCH Acceptance
CAND/USD	99%	280	0.0854	✓
	97,5%	367	0.1120	✓
	95%	479	0.1462	✓
JPY/USD	99%	187	0.0571	✓
	97,5%	244	0.0745	✓
	95%	324	0.0989	✓
SFR/USD	99%	91	0.0278	✓
	97,5%	138	0.0421	✓
	95%	194	0.0500	✓
SZF/USD	99%	150	0.0458	✓
	97,5%	219	0.0668	✓
	95%	296	0.0903	✓

Table 3. Experiments results for WDVaR (Haar,2)

Exchange rate returns	Confidence level	WDVaR (Haar) Exceedances	Kupiec Test (P-value)	WDVaR (Haar) Model Acceptance
CAND/USD	99%	210	0.0641	✓
	97,5%	302	0.0922	✓
	95%	414	0.1263	✓
JPY/USD	99%	178	0.0543	✓
	97,5%	241	0.0735	✓
	95%	315	0.0961	✓
SFR/USD	99%	81	0.0247	✓
	97,5%	130	0.0397	✓
	95%	178	0.0443	×
SZF/USD	99%	96	0.0293	✓
	97,5%	150	0.0458	✓
	95%	227	0.0693	✓

Table 4 . Experiments results for WDVaR (Sym6,2)

Exchange rate returns	**Confidence level**	**WDVaR (Sym6) Exceedances**	**Kupiec Test (P-value)**	**WDVaR (Sym6) Model Acceptance**
CAND/USD	99%	259	0.0790	✓
	97,5%	347	0.1059	✓
	95%	437	0.1334	✓
JPY/USD	99%	322	0.0983	✓
	97,5%	369	0.1126	✓
	95%	426	0.1300	✓
SFR/USD	99%	507	0.1547	✓
	97,5%	593	0.1810	✓
	95%	679	0.2072	✓
SZF/USD	99%	210	0.0641	✓
	97,5%	279	0.0851	✓
	95%	339	0.1034	✓

Table 5. Experiments results for WDVaR (Db4,2)

Exchange rate returns	Confidence level	WDVaR (db4) Exceedances	Kupiec Test (P-value)	WDVaR (db4) Model Acceptance
CAND/USD	99%	263	0.0803	✓
	97,5%	363	0.1108	✓
	95%	470	0.1434	✓
JPY/USD	99%	322	0.0983	✓
	97,5%	377	0,1150	✓
	95%	421	0.1285	✓
SFR/USD	99%	633	0.1932	✓
	97,5%	725	0.2212	✓
	95%	803	0.2450	✓
SZF/USD	99%	215	0.0656	✓
	97,5%	263	0.0803	✓
	95%	330	0.1007	✓

Table 6. Experiments results for WDVaR (Db4,5)

Exchange rate returns	Confidence level	WDVaR (Db4,5) Exceedances	P-value	WDVaR (Db4,5) Model Acceptance
CAND/USD	99%	251	0.0766	✓
	97,5%	363	0.1108	✓
	95%	456	0.1392	✓
JPY/USD	99%	289	0.0882	✓
	97,5%	349	0,1065	✓
	95%	412	0.1257	✓
SFR/USD	99%	631	0.1926	✓
	97,5%	706	0.2154	✓
	95%	779	0.2377	✓
SZF/USD	99%	195	0.0595	✓
	97,5%	249	0.0760	✓
	95%	326	0.0995	✓

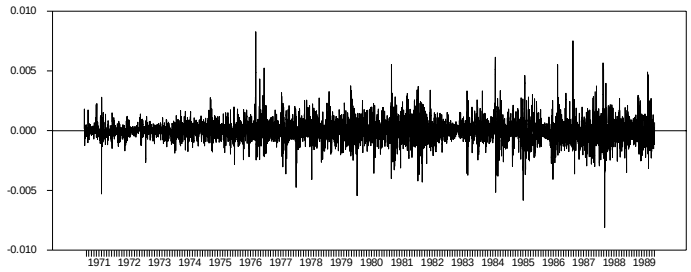

Figure1. Return series for CAD/USD

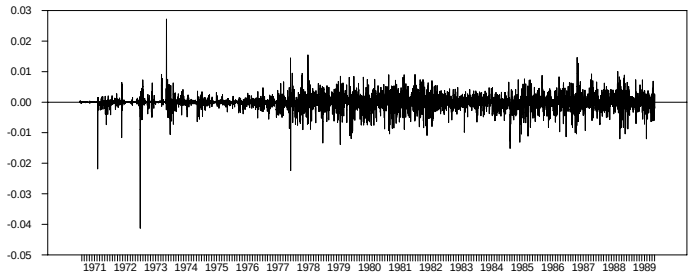

Figure 2. Return series for JPY/USD

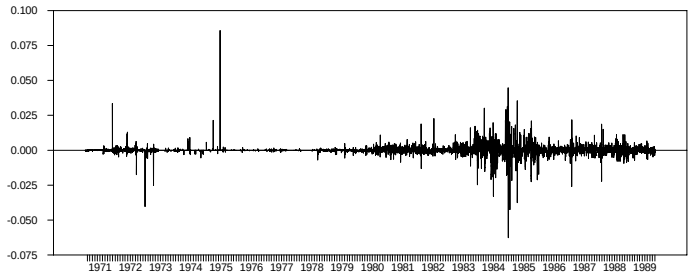

Figure 3. Return series for SFR/USD

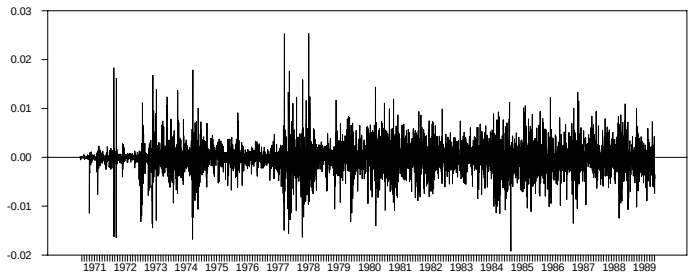

Figure 4. Return series for SZF/USD

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The Research of Promoting the Chinese Banking Industry Core Competitiveness under the Financial Globalization Background

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Abstract

Along with the Chinese financial market unceasing opening, the financial globalization tendency develops thoroughly, various countries financial market relation is closer, the internationalization degree enhances day by day. The financial innovation and the comprehensive management tendency develop unceasingly, between various professions seeps mutually. The international finance competition is more and more intense; the capital interstate flowing scale expands unceasingly, the element of certainty increases. If Chinese banking industry wants to survival and develop in the competition environment, only then promotes its financial innovation ability, according to the market demand change and own business development condition, promotes the financial product which can satisfy the customer and the market demand unceasingly, can expand the market share unceasingly, is in an impregnable position in the intense market competition.

Keywords: Chinese Banking industry, Financial globalization, Core competitiveness

1. The Chinese banking industry is facing the challenges

After China to join World Trade Organization transition-period had finished, the banking industry competition is more intense. Under this new situation, the Chinese Banking industry not only has the new development opportunity, but also faces a more stern challenge; it is in the important transition and the development time.

1.1 International finance environment

Since 2008, the external environment of Chinese Banking industry developed faced the aspect which worsens with the short-term. The American secondary loan crisis, the energy and the international bulk commodity raise in price causes the world economics to fall into the difficult position which the economic growth to postpone and the inflation in a short time.

1.1.1 Global inflation threat aggravating

Influence of the petroleum and the price raising, global resident consumer price indices CPI comprehensive rise since 2008. The US announces the data demonstrated that this country y CPI in May rises 4.2% than same time of last year, is the highest rise since January this year, core CPI has risen 2.3% than same time of last year. The European Union Statistics bureau issued the newest data demonstrated that the Euro zone currency inflation rate was once continual for 9 months to break through the European Central Bank 2% warning lines which establishes for maintenance price stability, currency inflation rate is that dramatic rise to 3.6% in May of 2008; The Russian April's CPI index already achieved 14.5%, creates highest level in the recent 5 year; the Vietnamese currency inflation rate reaches as high as 25.2% in May of 2008, Indonesia surpasses 10%, Philippines is 9.6%, India surpasses 8%, Thailand is 7.6%, South Korea is 4.9%.

1.1.2 International financial industry risk increases

The international Financial market will have the fierce turbulence in recent, the financial risk appears frequently. Take the American secondary loan crisis eruption as the symbol, the global economic entered the deceleration cycle. The American secondary loan crisis starts appear gradually from spring of 2006, it has swept across world main financial market and so on US, European Union and Japan since 2007 August. The US real estate market is also continuing at present to worsen at present, the financial market is unstable, the employment reduction and unemployment increases, the resident expected income to reduce, the consumer confidence to drop, the consumption expenditure growth to

stagnate, the contraction of credit, the investor confidence to suffer setbacks, the fixed capital forming to drop, the influence of loan crisis is further also deepening. But Vietnam financial crisis will highlight will possibly become the new round southeast financial crisis's blasting fuse. The French Bank cheat document once more has demonstrated the financial industry risk management importance.

1.2 Domestic financial environments

1.2.1 The risk of economical periodicity fluctuation is accumulating, bank asset quality faced with new test

The periodicity fluctuation is the economy moves inevitable regular performance.

As the emerging market economy system, China already experienced to continue fast growth more than 30 years, while the economy high speed steady progression, also accumulated such as the development imbalanced as well as the environmental pollution and so on, the economical periodic fluctuation risk is accumulating. Therefore, the Chinese industry, the profession as well as the economic structure are experiencing the huge adjustment. This kind of adjustment in the long run, no doubt has the great importance significance to the economical finance health sustained development, but looked from the short-term, the economic regulation possibly bring the new risk to the bank management, specially the tight monetary policy environment which take suppresses the inflation as the goal, as well as the strict environmental protection and energy conservation adjustment, will bring the development management pressure to the bank and faces the credit pattern readjusting, but the significant assets structure adjustment can cause the Commercial bank faced with the property quality worsens possibility.

1.2.2 Commercial banks will experience “the finance to escape the intermediary” and the interest rates liberalization dual converging attack, the Profit gap will squeeze.

In China, the interest rates liberalization already realized in the wide range, at present only has the standard currency to save the rate on loan maintenance control interest rate. In order to compromise the pledge when China joined World Trade Organization, the standard currency saves the rate on loan also to realize the marketability in the near future, the direct result that will be the bank saves the loan spread to squeeze. This will form the serious survival threat to Commercial bank which the tradition save and loan service primarily, the interest risk will also become the most main operational risk which Chinese Commercial bank will face from now on. Meanwhile, the capital market will obtain the further policy to encourage and to support, realizes a quicker development. In the bond market development in the increased speed foundation, markets and so on stock, fund, and commodity forward business will speed up the development step, the securities business and the insurance business development lag in banking industry's aspect will have the very big improvement. The international banking industry experienced the finance to escape the intermediary painful process in the last century 70-80 ages. The experience formerly indicated that the finance will escape the intermediary tendency proposed the stern survival challenge to the Commercial bank tradition modes of business operation and the structure, will cause the Commercial bank to face the bankrupt risk generally. Implements mixes industry management is main method and the way which the international Commercial bank gets rid of the survival threat which the finance to escape the intermediary brings. And, in China, the finance will escape the intermediary and the interest rates liberalization tendency will interweave in the same place, the interest rates liberalization will cause the bank spread will reduce tendency will intensify the speed and the scope of the finance to escape the intermediary.

1.2.3 Comprehensive opening bring the enormous challenge for the Chinese-funded bank.

China joined World Trade Organization transition-period already to finish, the domestic financial market opening assumed comprehensive and acceleration aspect, the foreign capital financial organ enters crowded, moreover even more paid great attention the strategic investor who fused into the domestic bank through the capital, gained the financial service network and the customer resources quickly. The domestic financial market's competition was evolving fast for the difference between the Chinese and foreign capital financial organ alliance organization competition, the competition pattern has had the comprehensive deep transformation, formed the serious challenge to the Chinese-funded bank.

2. Chinese banking industry development present situation

The recent several years, Chinese Bank competitive power really has been promoted. No matter is the capital sufficiency of capital and the property quality, gains aspects and so on ability and fluidity managed capacity has the distinct improvement. More importantly, the majority Commercial banks established the capital to supplement mechanism and saved use capital idea, established good risk management system which has enabled the property quality to guarantee even enhanced and promoted bank strategy reforming, service reforming and the profit pattern transformation which adaptation environmental variation and customer demand change positively. State-owned bank through reform going on the market reproduction vigor, original joint stock system Commercial bank to maintain the competitive advantage further promotes own competitive power through the internal reform, the city Commercial bank through the dyspepsia property, increases funding expands stock methods and the way and so on alliance, cross region management as well as going on the market, is clear about the management localization, launches the comprehensive

competition with each kind of Commercial bank in many domains. But, Chinese Commercial bank competitive power's remarkable enhancement cannot cover the existence question, mainly concentrates in five aspects:

2.1The mechanism of the company governs and internal controls not to be still imperfect

Through the bank remanufacture and going on the market, Chinese Bank Company governs has the improvement, but the subject of investment multiplication degree is still somewhat low, authority to keep in balance system validity to be bad, also cannot guarantee the trustee, the supervisor and high level managers assiduous fulfilling duty, also cannot achieve strictly accountability system to the significant dereliction of duty personnel. The higher managements seek the personal interest using the bank asset, causes the shareholder rights and interests not to be able to obtain the effective protection; The major stockholder using methods and so on connection transaction seeks the improper income, even endangers to the bank operational; The independent director becomes a mere formality phenomenon to be common, many banks only hope to use their popularity and the old relational display role, the improvement of governs to the company not to play the substantive function. After Commerce bank, Construction bank, Communications Bank and Bank of China stock reform going on the market, reforms to the depth advancement duty is also very arduous. The completely responsible phenomenon also is very specially common by "the chief leader" in the Branch office, lacks essential keeps in balance mechanism, in addition legal person organization decision-making control is limited, the branch office does not carry out, causes the basic unit organization illegally contrary, the major event serious case sometimes occurs.

2.2 The account executive and the source of income is still unitary

Although Chinese commercial bank non-interest return proportion rises with steady steps, but financial innovation ability low question not radically solution. Even if in the Asian and Pacific area, Chinese commercial bank non-interest return is also at the inferiority position compares with other foreign bank. For example, the non-interest of Japanese Tokyo Mitsubishi Bank and Australia National bank non-interest return respectively achieves 56.6% and 44.4% in 2006, but the same time China ICBC is only 8.8%. Causes this kind of pattern is because various reason: First, Chinese Commercial bank is been microscopic intervention serious by all levels of the government for a long time, monopoly management, contents with the status quo, neglects development to the new service variety, causes the business of banking scope to be narrow. Next, is supervised system influence, China legal rule that Commercial bank can only be engaged in the business operating at a liability, the asset operation, but cannot look like the overseas bank such to provide including the loan, the settlement, the consultation, the investment, the proxy insurance and the trust investment "the supermarket service", causes the bank finance variety to be monotonous.

2.3 The high-end talented person who matches with the modern bank enterprise is still deficient

The Commercial bank is the knowledge intelligence intensity industry; the talented person is the important support of the modern bank competitive power. Especially along with Chinese economy marketability degree unceasing enhancement, the uncertainty strengthens in the economical movement, the bank operational risk enlarges, urgent need high-end talented person manages the risk, operational risk, but the high level talent in this domain is obviously insufficient in China.

2.4 The Commercial bank exterior living environment waits for optimizing

First, the banking supervision validity still waited for further enhancing. Especially between the banking supervision and the financial innovation is also unable to achieve the balanced and coordinated development, the supervision level, the method relative lag, has restricted the Commercial bank competitive power enhancement. Second, the fund price receives the control. Chinese Commercial bank had already formed thought format of the interest rate, the foreign exchange fluctuation non-risk, consciousness the financial risk not to be strong on own initiative, because is unable forecast and guard risk better , causes the Commercial bank competitive power to receive weakens greatly. Third, China Commercial bank tax burden is heavy. Although the financial industry business tax rate already dropped to 5% from 8% in 2001, but looking from the global scale, the Chinese Banking industry business tax rate is the highest in the world, the majority countries do not levy in business tax, even if levies, tax rate is also 1.2-4%.

2.5 In the financial norm performance aspect, Chinese Commercial bank still had the disparity

Because the commercial bank company governs not perfectly, financial innovation ability is limited, the high-end talented person flaw, the external environment restriction, has the influence inevitably to the financial norm. Looking from the property returns ratio, although Chinese property scale surpassed 1,000 billion RMB, the ROA level of Commerce bank, Bank of China, Construction bank, Communications Bank, businessmen bank already to surpass 1%, was in the superior level in the world 1000 big banks, but to be very still big disparity compared with the international advanced level. For example the American Bank property returns ratio achieves 2.19% in 2006, but the Indonesian Banking industry property returns ratio has achieved 1.92% in 2002, hereafter maintains at 2% above level. Looking from the capital sufficiency of capital, Indonesian, Thai, the South Korean Bank capital sufficiency of capital respectively achieves 20%, 13.85% and 12.31% in 2006; the Japanese 9 greatly Main bank capital sufficiency of capital

achieves 13% equally. Looking from the non-performing loan proportion, in 2006 ,South Korea Commercial bank non-performing loan proportion already dropped to 1% below, the Japanese 9 greatly Main bank non-performing loan proportion dropped to 1.5%.

3. The Chinese Banking industry promotes the core competitiveness countermeasure

3.1 Initiative transformation business model and the growth way.

Facing the pressure which the tradition loan market and the income squeeze which the domestic interest rates liberalization and "the finance to escape the intermediary" brings, the intensifies pressure which facing the international domestic competition, Chinese Commercial bank must implement the business model, the growth way and management structure strategic reforming on own initiative, develops the comprehensive management positively, the across-the-board adjustment assets structure, the service structure, the debt structure, the income structure, the customer structure, the marketing channel structure as well as the staff knowledge and the skill structure, realizes the business model by to expand by the scale primarily to by the quality benefit transformation primarily, realizes the growth way to save the loan business income by the main dependent tradition to the multiplex integration income transformation, promotion core competitiveness and the financial service level, cause the Chinese Banking industry to become the world first-class modern finance enterprise which has strong innovation ability and the international competitiveness.

3.2 Increase the independent innovation, promotion core competitiveness

As state-owned joint stock system Commercial bank, to deal with the intriguing international domestic condition of business, melt constitutive property and the institutional risk, promotion core competitiveness and the international competitiveness, must found the innovation bank, through advances the system, the mechanism, the management, the service and the technological innovation vigorously, impels the business model and the growth way transformation and the competitive power enhancement. Must speed up the integrated management step through the innovation, by merger and acquisition, joint capital service domains and so on way development the securities ,the insurance, establishes China own investment bank and financial holding group which has the complete service; Must complete service and the management flow transformation with steady steps through the innovation take the customer as central, take the risk control as the core, establishes the highly effective marketing team and the formidable product support system, making specialization and centralized risk management platform, completes transformation from the department bank to counter current regulation bank; Must display the finance technological innovation impetus and the support function to the service and the institutional innovations, optimization science and technology input structure, raises the technical development efficiency, enhancement introduction digestion absorbance and independent innovation ability, surpasses the international financial industry advanced science and technology level comprehensively. Moreover, along with Chinese economy and world economics integration process's quickening, foreign trade scale will expand rapidly, the international market fluctuation will strengthen unceasingly to domestic market's influence, the domestic enterprise will face the more and bigger and more directly international market risk during participation international market competition, therefore, the market will have the formidable demand to the financial derivation tool which will dodge the market risk ,such as commodity futures exchange, the exchange rate option, the forward exchange transaction and so on,; The foreign capital exile scale expands, the capital market opening to the outside world and with international capital market integration process quickening unceasingly, also will initiate to the exchange rate, the currency derivation tool as well as the exchange transaction demand; For the consummation domestic Stock market, introduction option transaction is also the realistic demand. Therefore, development finance derivation tool market will become Chinese financial market development choice inevitably in the future, is also Chinese banking industry service innovation direction.

3.3 Deal with the challenge of the Chinese banking industry comprehensive opening to the outside world positively

The financial innovation is the Commercial bank competitive power important fountainhead. The contemporary finance product innovation has two general trends; first, standardized standard service; second, personalized financial service. In view of the former, the Commercial bank must raise the customer service self-service level diligently. In view of the latter, the Commercial bank must unify the customer concrete demand at the same time, design product and the service which has the high knowledge and the technique content, brings the great value for the customer; On the other hand, the Commercial bank must develop the remittance, the settlement, the guarantee, the proxy, the trust, the consultation, the fund trust, individual managing finances, the investment management and so on middle service vigorously, creates and forms the new profit point of growth diligently. During studies and introduces the advanced bank financial product, pays great attention to strengthen the independent innovation ability construction, sharpens the innovation product fixed price ability.

3.4 Consummate Commercial bank's risk to control from the inside

The Commercial bank operational risk ability as well as controls from the inside mechanism quality, immediate influence its own competitive power. In the Commercial bank risk management aspect, must realize the risk

management scope completely: first, guarantees the risk management content universality, also includes risk each type, also contains the business scope of bank interior each level; second, guaranteed that the risk management personnel have the universality, not only dependence risk management department, must rely on to the board of directors member and each staff of bank, forms the risk management diligently culture diligently; third, guarantees the bank risk management link's integrity, not only involves the trade development each process, completes the customer admittance, to investigate before loan earnestly, in the loan examines, the loan, manages after loan and so on, must involve the service development each region, achieves effective appraisal and the early warning to the risk between the nationality and the local transformation and shift. Is consummating the bank to control from inside aspect, the key is that completes the organization restoration and the flow reorganization, speeds up realizes the service line and the level flattening, establishes the keen market reflection mechanism, the effective quality control system, the advanced risk and cost control ability, through widespread, diverse marketing channel and overlapping sale, provides quickly, satisfaction integrated management service for the customer.

3.5 Raise the bank informational level unceasingly.

The informational level is also weighs the Commercial bank competitive power height the important symbol. The modern bank's competition, in some kind of degree says, was one modern technology competition; the technology first has created the superiority with the information forerunner for the bank competition. It can be said that the present information technology's progress and the modern bank's development is the relations which promotes mutually. Since the 1990s, has obtained the swift development take the Internet as representative's information technology, simultaneously has had the major impact on the world economics, this is so-called “the new economy” the phenomenon. “the new economy” while is raising the labor productivity, to promote world economic development enormously, also has formed the huge challenge to the traditional economy. First, “the new economy” to the traditional economy's impact manifests, to already has the market to compete on. The Internet has the superiority which the traditional media is unable to compare, can take a quicker speed, in bigger range provide the convenient service as the large-scale customer. Relies on its superiority, the Internet enterprise corrodes the Traditional enterprise gradually the market share which only then strives for diligently through many years. In the financial industry this kind of service industry, Internet's superiority manifests the outstandingly. As has more than 100 year historical American fifth big bank Morgan Banks, also intimate understanding “new economy” impact. The Morgan Bank primary service domain is grows the negotiable securities the transaction and the risk management. The customer and the cost are its establishment competitive advantage most important factors. But will carry on these services on the Internet to be easier to contact the general small client base, but can also the large curtailment of service cost. On the other hand, “the new economy” is also competing for the intelligence resources with the traditional economy. Internet enterprise's large amount risk capital investment, the nimble assignment system as well as are unable in the Traditional enterprise to realize the undertaking excitement, attracts these most to be having the entrepreneur who innovative spirit joins in “the new economy” in the flood tide. The west some developed Commercial bank in has paid attention to and the research Internet technology to the traditional financial industry influence, the research demonstrated that the tradition financial organ can profit at least in four aspects from the Internet technology application: 1 is advantageous to the financial service innovation; 2 are advantageous in enhancing the financial service the efficiency; 3 are advantageous in winning more customers; 4 are advantageous in cutting the cost of operation.

3.6 Establishment the perfect science effective motivation and restraint mechanism

Profits from the international advanced experience, constructs the new human resources management system, speeds up establishes a new human resources management system which staff and the enterprise communal development, the motivation and restraint effective. Through implementation the staff owns stocks plan reform in the ordinary staff , stresses the employee benefits, transfers the staff activity effectively, to display their creativity; implementation stockholder's rights drive system to the high level managers ,guaranteed that the high managers maintain consistent with the bank overall benefit, avoids the policy-making behavior short-term.

3.6 Pay great attention to optimize the external environment of bank competitive

Strengthens the commercial bank company to govern and supervision, supervision Commercial bank improves and consummates the management and operation system and the organization mechanism, through further enriches and consummates the supervision laws and regulations system, promotion Commercial bank competes reasonably. Advances the comprehensive management experiment site with steady steps under the minute industry supervision frame, is further clear about the Commercial bank product innovation scope, announcement encourages the product name list which the Commercial bank develops as well as forbids the product name list which the Commercial bank develops, in view of the product which do not in detailed list scope, carrying out permission Commercial bank advance development system. Strengthens to the Commercial bank finance innovation intellectual property protection, further transfers the Commercial bank finance innovation enthusiasm. Refers to the international standard, coordinated finance and taxation department, lowers the bank tax burden level.

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Micro Finance for Poverty Alleviation: A Commercialized View

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Abstract

The world is getting more matured in terms of level of sophistication. At the same time it becomes a threat due to the difficulty of having areas where further sophistication is possible. But, now, the most sensitive problem for all is the severe poverty. It is the darkest chapter of the world where more and more people are enlisting their names. If this process continued for unlimited time, once it will be suicidal for all of us irrespective of poor or rich. This paper put focus on the poor society, which concludes that if the poor are funded and focused, they can build their own fate. The poor need funds and suggestions to get rid of the curse of poverty. Grameen Model is outlined here with some replicated ideas so that it can be used in a more sophisticated and commercial way. Such commercialization will help to extend the scope of credit program from individuals to small businesses for which sometimes it may be difficult to get loan from regulated financial institutions. An earnest effort has been made to make the micro-credit programs and methodologies comprehendible with the process of diffusion and usability from a commercial perspective. Such perspective is important to give micro finance program an institutional modality that will ultimately ensure long-term existence.

Keywords: Micro Finance, Poverty Alleviation, Commercialization, Grameen Model, Bangladesh.

1. Introduction

"Poverty" and "Poverty Alleviation" are frequently heard buzzwords today. Poverty is a multidimensional phenomenon and depends on the context and perspective that one is looking at. A working definition from Professor Muhammad Yunus, the Noble Peace Price winner in 2006, is: Poverty is that characteristic of being in a state of joblessness, illiteracy, landlessness, homelessness, lack of adequate capital, facilities and food to earn a decent living and also powerlessness. Poverty alleviation is, therefore, the act of reducing the scourges of the above conditions of an individual or community. According to a statistics, about 1.6 billion people on the globe are in absolute poverty and the number is rising (Jammeh, 2002). All these poor people need help. And, poverty alleviation projects got priority at the time of fund allocation through budget in most of the developing countries.

Helping the poor is not so simple and easy as it is embedded within our socio-economic culture in an inseparable manner. There are various ways of helping the poor and one key way is the use of micro finance services. Micro finance has already got a lot of definitions and structures. Joanna Ledgerwood, a professional at the World Bank, defined micro finance as the provision of financial services to low-income clients (the poor), including the self-employed ones. She says that the financial services generally include savings and credit provisions (Jammeh, 2002). Last few decades are remarkable as the world witnessed a rapid growth of micro finance institutions (*MFIs*) to make the services reachable to the poor. *MFIs* use various lending models throughout the world. Some of the major lending models are: the Grameen model and its Solidarity Group version, Cooperatives and credit union model, visaca/village and Community Banking Model, and Rotating Savings and Credit Association (*ROSACA*) or Osusu model, Self Help Group (*SHG*) – Bank Linkage Model etc.

Fund is the constraint resources for most of the businesses. Thus, the success of business depends on the availability of fund. Micro finance programs ensure availability of fund without collateral. The methodology, introduced by Grameen Bank as Grameen Model, has ushered a new paradigm in lending arena. The success of the model attracted practitioners across the globe to replicate the same and the world has witnessed a large number of successful stories of how people are coming out of poverty.

The World Microcredit Summit Campaign, in its website for Countdown 2005, has outlined nine best practices for microfinance (Jammeh, 2002), which are as follows:

(a) Ensuring loan repayment.

(b) Moving towards institutional sustainability.

(c) Targeting the poorest and covering costs.

(d) Sustainability in industrialized countries.

(e) Empowering women.

(f) Establishment and use of poverty measurement tools.

(g) Measuring impact on the lives of clients.

(h) Mobilizing savings and ensuring their safe use.

(i) Recruiting, training and retaining excellent staff.

The combination of these best practices in the appropriate proportions is useful in poverty alleviation and other development plans. However, since microfinance deals with both business and human relationship, which involve a lot of risk-taking, the risks taken need to be managed properly.

In this paper, the Grameen Model has been outlined as a successful model of microfinance that is replicated in most of the countries over the globe. This represents its acceptance by global community. Grameen model is critically presented here with the preconditions, necessities and prospects of commercialization to ensure a sustainable economic development by alleviating poverty. The conventional micro credit model is refined conceptually in a substantial manner to give it all possible shape and to harvest maximum benefits out of it by the poor folk of the society. With the progress of commercialization, such micro finance facilities may also be opened for small businesses to ensure smooth economic development. Thus, the paper has policy interest also. Micro finance as presented here will work as a weapon against poverty for poor folk of the society and at the same time if it can be commercialized in true sense, small enterprises will be benefited by getting loans easily.

2. Background

Micro credit and Grameen Bank are inseparable concept for the discussion of the literature. Grameen Bank is the institutionalized version of micro credit model. And, Professor Muhammad Yunus, the developer of micro credit concept, and the Grameen Bank becomes the symbol of pride for Bangladesh with the declaration of Noble Peace Price in 2006. Micro credit, thus, gets global recognition. Due to such recognition, more care is warranted regarding the use, implication and effect of micro credit on the poverty level to keep its original essence intact. Monopolistic power, excessive interest rates and exploitation through under-valuation of collaterals have restricted the informal financial sector to provide credit to poor people for income generating and poverty alleviation purposes (Bhaduri, 1983; Rao, 1980; Bardhan, 1980; Ghosh, 1986, Ghate et. al., 1992). The limitations of the formal and informal financial sector in providing financial services, especially credit, encouraged the micro credit program to evolve. The micro credit program was initiated with the objective of providing poor people with credit without collateral. Professor Yunus called the process of substituting the provision of collateral with group harmony and other aspects of micro credit as 'freeing of credit from the bondage of collateral' (Yunus, 1997). The traditional Micro credit model was so simple where bank or non-banking financial institutions give credit directly to self-help group (*SHG*) or through *NGOs* as shown below (**Figure 1**).

Insert Figure 1 Approximately Here

The origin of the current microcredit model can be traced back to action research in the late 1970s, carried out by academics as well as practitioners in organizations that were created to deal with the relief and rehabilitation needs of post-independence Bangladesh. The 1980s witnessed a growing number of non-governmental organizations (*NGOs*) experimenting with different modalities of delivering credit to the poor. The predominant model become one of providing individual loans to a target group of poor households, rather than providing loans for group projects which suffered from a 'free-rider problem'. The various models converged around the beginning of the 1990s toward a fairly uniform "Grameen-model" of delivering micro credit (Zaman, 2004). A 'franchising approach' whereby new branches copied the procedures and norms that prevailed in existing branches fueled the Grameen-style growth. From the mid 1990s onward, it became clear that the standardized model of providing micro credit with fixed repayment schedules and with standard floors and ceiling on loan size were not sufficient to meet the needs of the extreme poor. In recent years, the standard Grameen-model has undergone greater refinement in order to cater to different niche markets as well as to different life-cycle circumstances. Figure 2 below shows the growing demand of micro credit facilities over a period of about 6 years (2003 – April, 2006)

Insert Figure 2 Approximately Here

The micro credit is only the one side of microfinance industry. The poorest households also have an effective demand for safe deposit facilities (Rutherford, 2000). While the amount of their deposits is small, this does not mean a lack of demand. With flexible deposit and loan products, SafeSave in Bangladesh has been able to reach some of the poorest

households in Dhaka slums. Similarly, about 7% of Mibanco clients in Peru belonged to the poorest category (ACCION International, 2003).

Questioning the clubbing of varied forms of credit lending such as moneylender's credit, pawn shops, agricultural credit, livestock credit, rural credit or cooperative credit etc under the broad label of 'micro-credit', Yunus proposed a definition of 'Grameen credit' which embodies the principles of the Grameen Bank (Murthy, 2005). The objectives of the Grameen Bank are: to extend banking facilities to poor men and women; eliminate the exploitation of the poor by moneylenders; create opportunities for self-employment for the vast multitude of unemployed in rural Bangladesh; bring the disadvantaged, mostly women from the poorest households, within the fold of an organizational format which they could understand and manage by themselves; and reverse the age-old vicious circle of 'low income, low saving and low investment' into a virtuous circle of 'low income, injection of credit, investment, more income, more savings, more investment, more income' (Figure 3).

Insert Figure 3 Approximately Here

It is remarkable that the micro finance industry in Bangladesh has been able to provide access to credit to around 13 million poor households. There are around twelve hundred micro finance institutions currently in Bangladesh, although the industry is heavily concentrated in a handful of large organizations—Grameen Bank, *BRAC*, *ASA*, and Proshika. These four cover around eleven and a half million or 90 percent of all clients as shown in Table 1.

Insert Table 1 Approximately Here

Looking at Bangladesh's experience in perspective, one can argue that the current, remarkable access level is attributable to some specific factors:

First is visionary leadership within the pioneering microfinance organizations. The founders and leaders of Grameen Bank and *BRAC*, in particular, created decentralized structures with appropriate incentives that encouraged high staff performance, which in turn underpinned rational expansion based on existing capacity and client demand.

Second, the government of Bangladesh created a supportive macro-economic environment and implemented a "hands-off" regulatory policy.

Third, donors played a constructive role by providing resources at the appropriate time. This included funding the initial expansion phase of several micro finance institutions and then building the institutional capacity and systems needed to ensure sustainability.

Fourth, high population density and relative ethnic, social, and cultural homogeneity made "franchising" the micro-credit model less difficult, and significantly propelled its expansion.

Fifth, the public-private micro-credit "wholesaler", *PKSF*, was able to take advantage of already-established retail capacity to scale up the micro credit industry, as well as demand professional standards and a focus on sustainability.

3. Methodology

The basic foundation of the study is based on the secondary sources of information like research papers, conference papers, working papers, speeches, web documents, books etc. Primary sources of information are limited to personal observation and face-to-face interviews. Micro credit models, its replication and commercialization issues come from the secondary sources. And modification or extension to the current models is the result of critical observation and interviews with the facilitators, both the lenders and borrowers.

4. Grameen Model: *A Poverty Alleviation Concept*

The Grameen Bank originated in rural Bangladesh in 1976. Initially, the Bank was formed to test the hypothesis that if financial resources were made available to the poor at reasonable rates of interest, they would be able to generate productive self-employment without external assistance. In line with this hypothesis, the target groups of the Bank are the poorest of the poor, who are almost exclusively women (McDonnell, 1999). Experience obtained by the Grameen Bank suggests that potential borrowers need to complete several steps in order to ensure loan repayment. Firstly, the members have to select five persons of their own to form a group. Loans are more likely to be repaid if groups include only individuals of the same gender, from the same village and from similar economic backgrounds (Khandker et al., 1995). Before a loan is granted, groups participate in a weeklong training program where they are taught the rules and regulations of the Bank. If the Bank is satisfied with the group's response to this training then loans are sanctioned. Each member identifies the purpose of his or her loan with guidance from other members of the group. Loans issued to new members are small, approximately BDT 2,000 to 5,000 with an upper limit of BDT 10,000. All loans are repaid in weekly installments over a period of a year. Interest rates are currently fixed at 20 percent per annum (Hossain, 1993).

To overcome problems of loan defaults, the Grameen Bank has developed a system of mutual accountability based on a peer group lending structure. Under this structure the group as a whole becomes ineligible to receive any additional loans if any member of the group defaults. This ensures that peer pressure is exerted on members to maintain regular

payments. A group may decide to fine or expel a member who fails to attend group meetings or who willfully defaults on payments of installments. Conversely, groups may encourage and support a member who cannot repay in times of genuine difficulty. A member may leave the group when loan is repaid. If a member leaves before repaying loan, the responsibility for repayment falls on the group as a whole. In this way the mutual accountability fostered by the Bank works as a form of social capital, as opposed to the financial capital, which is the basis for mainstream commercial banking (Hossain, 1988).

The process of forming groups by allowing members to self-select has been found to reduce the credit risks associated with lending. Each member of a group is awarded loans depending on the outcome of other members' loans; individuals have an incentive to join a group where all members have an equal, if not lower, credit risk than themselves (Varian, 1990). Simply when one individual has a higher credit risk than all other group members, then that individual is being subsidized by the rest of the group (Stiglitz, 1990). The Grameen Bank policy of lending to relatively homogenous groups comprising of members of the same sex and from similar economic backgrounds helps to explain why the Bank's repayment rates are far higher than loans programs in which groups are formed on the basis of administrative decisions (Huppi and Feder, 1990). Thus it appears that successful peer monitoring requires that borrower groups are comprised of relatively homogeneous membership.

Successful peer monitoring also requires a small borrower group. Small groups foster closer ties among members and can reduce the cost associated with accessing information. Practice has shown that group size has a marked impact on the repayment rate associated with loans, with groups of 100 members performing far worse than groups of 10 to 20 members. The Grameen Bank has settled on a group size of five through a process of trial and error. Initially the size of Grameen Bank groups was ten or more members. This proved unsatisfactory however, because as groups become larger the diversity among the economic conditions of members increased and the decision-making process became lengthy. Finally five-member groups proved the most practical size (Huppi and Feder, 1990). Another reason for maintaining a small group size is that as group size increases, the incentives of individual members to monitor the action of their peer falls. This reduced incentive occurs because with increasing membership the costs to each individual from a defaulting member falls and therefore the incentive to monitor behavior decreases. Finally, it is argued that there is a free-rider problem associated with large groups in that each member would prefer that others monitor and incur the ill will resulting from reporting offenders who have misused the funds lent to them (Stiglitz, 1990).

Insert Figure 4 Approximately Here

The social relationship or social capital that exists between members also has a direct impact on the repayment rate of a group. A dominant feature of many communities in developed countries is the degree of interdependency that exists between individuals. Within this context village organizations often serve to provide welfare services and infrastructure. Participation in village life often requires a restraint on self-interested behavior and a variety of enforcement mechanisms, in the form of social sanctions, are invoked to ensure this. Working from this understanding, it has been argued that if an individual does not repay their loan this will cause a loss to other members of the group invoking social sanctions against the defaulting member (Besley and Coate, 1995; Cable and Shane, 1997). The types of penalties that may be imposed on a defaulting member of a group include the loss of material goods and reputation. Within the Grameen Bank, contributing members report the behavior of a defaulting member at a central meeting, thereby augmenting the admonishment felt by the defaulting member. Also other members of the group will reduce their cooperation with the defaulting member in the future. This penalty can be particularly devastating if there is some form of exchange or mutual support that occurs between group members independent of the loan scheme. For example, group members may rely on each other's help in productive activities or may help each other in times of trouble. Finally, if social penalties are sufficiently severe, group lending will yield higher repayment rates than individual lending (Beasley and Coate, 1995).

Thus it appears that social capital, in the form of sanctions available to community members to discipline poor repayment behavior, is a key element in the operation of group lending schemes. This may explain why group-lending schemes, such as the Grameen Bank, have been so successful in developing countries where interdependence within communities is typically high (Besley and Coate, 1995). In contrast, an absence of interdependence in most communities in developed countries may help to explain why group-lending schemes in these countries have been less successful.

Indications of the success of the Grameen Bank's micro credit model in Bangladesh are the repayment rate of its loans and in the benefits accompanying its membership. Between 1987 and 1992 the repayment rates of the Grameen Bank's individual loans were consistently in excess of 95 percent. These repayment rates are higher than those recorded by most mainstream financial institutions. In terms of the benefits that accrue to members, studies indicate that membership of the Grameen Bank empowers women (who make up approximately 95 per cent of all members) (Rahman, 1986; Goetz and Sen Gupta, 1994; Hashemi et al., 1996), increases the income and employment opportunities of members (Hossain, 1985, 1988; Alam, 1988; Khandker et al., 1995) and improves their housing (Rahman and Hasnat,

1993; Wahid, 1994) and nutrition (Wahid, 1994). Interests paid by the borrowers are not subsidized. Charging a relatively high interest rate that covers the full cost of the program and which the poor are apparently willing to pay, appears to be a win-win proposition (Morduch, 1997). This strategy is consistent with the lessons learnt from the experience of earlier cooperative and other government aided credit programs for the poor, whose failure has been blamed on the subsidized interest rate policy (Adams et al., 1984).

5. Grameen Model Replicated

The financial viability of the Grameen Bank and its ability to promote welfare gains for the poor has led to attempts to replicate the model in developing countries in Asia, Latin America and Africa, and in developed countries such as the United States, Canada and Australia. The Grameen Bank Replication Program of Grameen Foundation USA was established in 1999 to support institutions and social entrepreneurs throughout the world who seek to replicate the Grameen Bank approach, or scale up existing programs to provide financial services to the poor. Through 52 partners in 22 countries (including the US), the Grameen Foundation USA currently affects close to 1.2 million of the world's poorest families (Grameen Foundation USA, 2004). Jain and Moore (2003) note several reasons that the Grameen model has become the most important in terms of replication. Some of these are to do with the Grameen Bank itself, its relatively early development, and its leadership, which has been especially active and effective in publicizing the virtues of the Grameen model and in doing so in terms that appeal to donors. MEDA was the first organization to promote micro-finance through savings and loan cooperatives in Bolivia. The rapid success that it had with San Luis and other partners created a demonstration effect. According to staff interviewed, following MEDA's lead, other cooperatives began to develop micro-finance programs (Hamilton, 2000).

Muhammad Yunus, the founder of the Grameen Bank, as well as other founder of Grameen Bank replications in Asia, advocate an approach in which that the Bank model can be used as a pilot project in another country. Under this approach the Grameen Bank is first introduced as a small-scale experiment in a new country. The experiment is closely monitored and the institution is modified to suit its new environment. Importantly, the learning process approach recognizes the inherently experimental nature of the transfer process and acknowledges that success is not guaranteed (Hulme, 1990).

Features relevant to the process of replication include the ability to reduce costs incurred by a lending agency by maintaining high repayment rates and lowering transaction costs incurred by borrowers (Hulme, 1990; Todd, 1996). The experience in Malaysia, Sri Lanka and Peru has pointed out that the high repayment rate of the Grameen Bank is closely associated with its peer group lending structure. In these countries the peer lending structure enables agencies to keep costs low by allowing field officers to handle relatively high account loads, up to 300 per officer (Hulme, 1990; Todd, 1996).

As mentioned earlier, the ideas and methods of the Grameen Bank have not simply diffused across Bangladesh; they have spread across the world. The global image of microfinance is shaped by Grameen Bank and there are at least 52 direct Grameen replicates operating worldwide, including in the US. Formally, there are two direct mechanisms through which such policy transfer operates. First, the Grameen Bank runs scores of international seminars each year that train people from other countries to learn how to replicate Grameen Bank. It provides field visits, manuals, puts participants into a replicators network and can even provide start up grants through linking to the Grameen Bank Replication Program. The Grameen Trusts newsletter (*Grameen Dialogue*) lists 131 partner organizations in 35 countries (April 2005) with a client base of over 1.8 million in October 2004. The second mechanism is the Microcredit Summit. Different style of micro finance is depicted below (Figure 5) that is also the outcome of replication.

Insert Figure 5 Approximately Here

Micro finance program may be run for group or individuals. Individual lending programs run by commercial banks in a commercialized way. But, group-lending programs are run by NGOs or MFIs or sometimes some designated banks working in these area. The Group Model's basic philosophy lies in the fact that shortcomings and weaknesses at the individual level are overcome by the collective responsibility and security afforded by the formation of a group of such individuals. Such group may be solidarity or community-based organizations. Grameen Model used by Grameen Bank is the best example of solidarity group. Village banking was pioneered by the Foundation for International Community Assistance (FINCA International). Founded in 1984 by American economist and development practitioner John Hatch, FINCA began in Bolivia, spread throughout South America and had expanded into Africa by 1992. It is a good example of CMLF. Rotating Savings and Credit Associations (ROSCAs) are essentially a group of individuals who come together and make regular cyclical contributions to a common fund, which is then given as a lump sum to one member in each cycle.

6. Criticism of Micro Credit and a Targeted Snapshot

Ironically, the so-called exploitative moneylender has been replaced with an army of moneylenders. Though the motive was to drive the exploitative moneylender away, in effect exploitation has been legitimized through the neo-institutional

mechanism of micro-credit. With interest rates exceeding the repayment capacity of the poor, a debt-trap has been laid. Micro credit has been designed to create an illusion, much like electoral promises. At the cost of the poor in Bangladesh, Grameen has grown to sky-scraping heights (Sharma, 2005). Micro credit programs across the world have bagged a lot of criticisms like these. Some of the specific criticisms of micro credit programs are:

(1) They are wrongly offered as the Solutions or Panacea to eradicate poverty;

(2) It is a trap of indebting the poor;

(3) Poor are asked to look after themselves;

(4) Coercion and high rate of interests are common observations;

(5) It does not help the poorest of the poor;

(6) Men are left out but the credit reaches men through women and is misused and burden of repayment lies on women. The author personally come up with a situation where the husband pressurized the wife to get loan and then the husband went for a second marriage spending the loaned money divorcing the first wife.

(7) Ironically, in most of the schemes, women's own money is locked up, and they are forced to take a loan against their own savings at a higher interest. NGOs have become collecting agents for banks which are trying to increase their penetration of credit. (Murthy, 2005)

(8) NGOs, banks and corporations have benefited from micro-credit at the cost of the poor (Sharma, 2005)

(9) It is being used to promote products of *MNCs*.

(10) Women empowerment was a basic target of grameen model of micro credit. But the reality is different. As per one study, only 0.2% of Global commercial lending reaches to the poor women. A study of 38 branches of major banks in India found that only 11% of the borrowers are women (UNDP, 1995). So the present schemes of NABARD, SIDBI and Rashtriya Mahila Kosh are welcomed, as they are able to cater to the poor through *SHGs*.

Now, in the light of the criticisms as mentioned above, the author believes that the conventional micro credit models are targeted to ensure the sustainability of the credit giving institutions (*MFIs*). It operates in a way of so called good sounding theories where a very short period is targeted. But, poverty is not a short-term phenomenon. The current models undoubtedly give independence from hunger, ensure works or jobs but at the cost of long-term sustainability that can never alleviate poverty from the economic structure. The current models need a targeted snapshot where lenders will have a vision in mind regarding what they want the photographs look like after, say, 20 years. Let me explain the way. Everything is ok with the current model except a focus that the poor people need. They need funds, they need jobs/works, they need earnings, and they also need suggestions to spend their earnings. The micro credit model can be reproduced with this new insight as presented in **figure 6**.

Insert Figure 6 Approximately Here

Conventional micro credit model have no indications regarding the uses of earnings. Such models like to look after the invested fund, not for the effective use of it but for timely recovery. And there are special provisions for the defaulters. Under the current models, the success is often sought for ensuring earnings to those who have no or less earnings earlier, for ensuring foods three times a day who might remain starved earlier. The models can be compared with the Chinese Proverb of: "Feeding Fish to someone who has no access to fish." But we should materialize the learning from the proverb: "Without giving fish to someone, let him learn the way of catching fish. Then you will ensure fish for him throughout the life."

The persons, who qualify the loan/credit, have such potentiality to earn. But, most often they lack the capacity to utilize the earnings. If the credit giving institutions help them in this respect, it will be helpful for them and for the society as well. Here, five possible areas have been identified as per the availability or sufficiency of earnings to add new insight with the model. If all of the areas are taken care off, poverty will be a history for a community.

(1) *Loan repayment:* This will be the first responsibility of the borrowers to repay the loan as per the terms. This is needed for the sustainability of the loan giving institution to have a long continuance so that more and more individuals can avail the facility.

(2) *Family consumption:* Earnings lead a man to have a decent living. For a poor man, a decent living means ensuring of food for the family members so that the family enjoys full independence from hunger. For such expenditure, the world economy will be benefited due to pressure in demand that leads to maximum production.

(3) *Community development:* A portion of earnings may be used for the development of the community, which will ensure a supportive environment for all of us. It is our commitment towards the society where we live in.

(4) *Capacity building:* Poverty will never be alleviated if we cannot ensure our full independence from illiteracy and ignorance. We must not expect that profession will be inherited. To develop a strong generation, we need investment in capacity building. We should take oath: 'No child will work as infant; rather they will go to school.' Only then, they can build their own fortune. This is a must for ensuring long-term retirement of poverty.

(5) *Savings:* Savings is for the independence from micro credit itself. We expect that the circle of micro credit will stop today or tomorrow due to accumulation of savings that will once finance the project.

7. Commercialization Approach

Commercialization is characterized, according to Christen (2001), by profitability, competition, and regulation, but at the same time large differences in loan size are observed between regulated and unregulated institutions. In 2001 Christen inventoried 205 MFIs in Latin America, where seventy-seven MFIs (37.6%) were regulated and accounted for 73.9% of a US$ 877 million portfolio. In general, this phenomenon has been called the commercialization of microfinance. While unregulated MFIs recorded an average outstanding loan size of US$ 322 in 1999, regulated institutions recorded US$ 803, which is 2.5 times larger. Assessed in terms of relative wealth, the average outstanding loan size for unregulated MFIs represented 24% of GNP per capita in 1999, while for regulated MFIs this percentage was 49%.

As already mentioned it is useful to highlight the three key principles of what constitutes a commercial approach to micro finance: profitability, competition, and regulation. First and foremost, commercialization of microfinance is reflected in strong financial performance. Second, once microfinance institutions are committed to managing business on a commercial basis, competition quickly becomes a hallmark of the environment in which they operate. The very profits created by pioneering *NGOs* generate a demonstration effect, attracting others to follow suit and offer similar services. This, in turn, forces microfinance institutions to begin to make changes in product design, pricing, delivery mechanisms, or other basic features of classic businesses to preserve or increase their market share. Third, reaching sustainability is a precondition for obtaining a license, so it can be assumed that licensed, regulated microfinance institutions have already adopted a commercial approach. Regulated microfinance institutions are far more sustainable than unregulated microfinance institutions, although many of them started out as unregulated or specially licensed organizations clearly rooted in the non-profit sector.

8. Progress of Microfinance towards Commercialization

The strong financial performance of larger *MFIs* in Latin America is linked with a trend toward commercialization of microfinance in the region. In 1992 Banco Sol became the first example of an *NGO* transformation to a commercial bank and thus became the first regulated microfinance bank. Banco Sol surpassed other Bolivian banks in profitability and became the first *MFI* to access international capital markets. Following this successful example, at least 39 other important *NGOs* worldwide transformed into commercial banks over the period 1992- 2003 (Fernando, 2003). But, the transformation is not so simple. It is a sequential process as figured out (**Figure 7**) below:

Insert Figure 7 Approximately Here

Commercialization of microfinance is a relatively new consideration in Bangladesh. The term commercialization carries with it a negative connotation among many domestic microfinance stakeholders who equate commercialization with exploitation of the poor. Microfinance professionals worldwide, however, are increasingly using the term to include "the application of market-based principles to microfinance," with the realization that only through achievements in sustainability can *MFIs* achieve levels of outreach commensurate with demand. There is a growing realization that commercialization allows *MFIs* greater opportunity to fulfill their social objectives of providing the poor with increased access to an array of demand driven micro finance products and services, including not only credit but also savings, insurance, payments, and money transfers. In Bangladesh, we have already witnessed that some banks are offering collateral free loan to SMEs. Thus, the process of commercialization is on the way. Level of outreach will be increased for the small businessmen once this become a competition in formal and regulated financial sector.

Commercialization of microfinance industry involves several factors, including the degree to which the policy environment and legal and regulatory framework are conducive to the proliferation of commercialized *MFIs*, sufficient institutional capability, availability and access of market-based sources of funds to *MFIs*, etc.

9. Roles needed for Commercialization

The array of factors inhibiting the commercialization of microfinance implies specific roles for major stakeholders such as the government, funding agencies, *MFIs* themselves, and microfinance support institutions such as *PKSF* and *CDE*. General responsibilities and specific approaches to move commercialization forward are highlighted below for these stakeholders.

9.1 Roles of the government

Action by the Government of Bangladesh (GoB) is pivotal to the successful advancement of microfinance commercialization. Government can enable favorable policy environment for its advancement. It can also withdraw

maximum interventions so that more clients can avail the facilities and all financial institutions can engage themselves in micro finance program. In this case, government should also be careful to invest in physical infrastructure and provision of human services, particularly in rural areas, have the potential to boost effective demand for microfinance. A legal structure for commercial *MFIs* are of greater importance so that both deposit mobilization and lending can be done in a balanced way. It is very much important for sustainability of microfinance enterprises drawing from recent positive international experiences in Africa and Latin America. Government can also play a crucial role for ensuring security of the transactions devising new legal framework for micro finance operations.

Insert Table 2 Approximately Here

9.2 Roles of funding agencies

The role of the government is not enough for achieving success. Funding agencies have to work with the government to reduce the problems. They can help the government to develop an effective policy, legal and regulatory environment. In addition, they can help the MFIs to be self equipped by giving suggestions, assistances, trainings and any other needs required from time to time. This will help the MFIs to develop new market, enterprises, products, ideas etc. They can also help to develop a linkage between MFIs and NGOs with Banks to avail commercial funds.

9.3 Role of Microfinance Institutions

MFIs, themselves, have to do a lot to be transformed. They have to make a balance between profitability and poverty alleviation. They have to fulfill both commercial and social objectives though conflicting most often. To do this, they have to be cost effective. ASA's ability to reduce costs and keep interest rates low is the proof that very high efficiencies can be attained, even when serving poor people. They have to improve institutional capacity also to ensure sustainability.

9.4 Role of Micro Finance Industry Support Organizations

PKSF and CDF are major microfinance-support organizations that can play a leadership role in moving microfinance commercialization forward.

9.4.1 PKSF

PKSF can accelerate the pace of microfinance commercialization if they want, by eliminating its maximum on-lending interest rate criterion with support from the government. *PKSF* is an important member of the 11-member steering committee on regulation and is also the convener of the 8-member technical committee. It can influence the government through selected policymakers to design supportive regulation and supervision standards for the proposed new tier of specialized financial institutions engaging in microfinance.

9.4.2 Credit and Development Forum (CDF)

CDF can work for introducing a standard accounting system for its members and other *MFIs*. Its capacity building programs are consistent with commercialization and should be expanded because they stress operational and financial self-sustainability, product pricing/costing, cost efficiency, productivity and linking its partners with commercial sources of funds.

9.4.3 Credit Information Bureau (CIB)

CIB is very much important to commercialize the microfinance industry from where anyone can access the creditworthiness of any customer before sanctioning loans. All microfinance *NGOs* can come to a consensus to form such a *CIB* with their information and the information database will increase with the passage of time. For the first time, the government or funding agencies could fund a pilot system for sharing information on blacklisted clients before forming a full-fledged *CIB*.

10. Challenges and Implications of Microfinance Commercialization

Several challenges to microfinance commercialization exist at institutional (micro) and operational environment (macro) levels with both positive and negative implications. Proper care is the precondition to reap the maximum benefit out of it.

Most of the microfinance challenges come from the strong acceptability of *NGOs* by the target group. People have wrong perception that *NGOs* are working for poverty alleviation but other financial institutions are working to make profit that must not go with poverty alleviation. Again, if our *NGOs* want to transform, in most of the cases they cannot, as they haven't the required institutional capability in terms of skilled manpower, infrastructure, cost structure etc. Our *MFIs* have no clear vision about what to achieve. This is due to the fact that over the decades they are running their poverty alleviation program and it becomes our national slogan but the result is not satisfactory. Till, an amazing number of people cannot avail the fund or if availed, cannot use it to get out of the net of poverty. Even micro credit program run by government has showed a poor performance. Another important challenge is lack of collateral, as poor people have no assets to back their loan and so a higher level of risk on non-repayment is very much prevalent here. For

reducing this risk to some extent a credit information bureau (*CIB*) is required to be formed with all necessary institutional, regulatory and legal formalities. The legal and regulatory environment must be supportive and conducive with a clear vision of the respective authorities. A true commercialization should have the motive to reduce the demand of soft or subsidized or donated loans that will ultimately reduce our donor dependency and leads us to financial and economic sustainability. At the end of 2000, such funds accounted for about 41% of the loanable funds for the microfinance industry. It is obviously a bad signal for the sound development of financial and capital market.

Commercialization has a lot of positive and negative implications. Most of its negative implications generates from human psychology, controversial explanation and flaws of application that can easily be solved if the authority has sufficient commitment. Critics of commercialization believe that it leads to 'mission drift' by giving less focus on the poorest of the poor. Thus many poor households would remain unserved who are presently under the net of micro credit. Focus may also be lessening from women folk who have a great contribution towards family income. Commercialization may also increase the loan sizes by reducing the number of clients to ensure more control and reduce transaction and recovery costs. The rate of interest may rise due to the fact that the invested funds will have costs that will be recovered by charging the loan receiver only. These are the negative perceptions of potential users against commercialization though most of the problems can easily be solved by a proper system.

11. Commercialization Model

Commercialization has no generalized model. But from the available literature, a model can be proposed that is required to be adjusted with the country specific situations. For commercialization, any country must have favorable legal environment and then institutional capability comes. Last of all, we need to establish operational efficiency from commercial point of view. The total process is depicted in figure 8.

A supportive external environment where such NGOs/MFIs work is the foremost requirement. Such support should be ensured in policy level. Say, in Bangladesh, if the Bangladesh Bank doesn't permit MFIs to operate in a commercialized way, commercialization becomes impossible. Once external environment becomes conducive, internal maturity comes into the limelight. Depending on the donated funds and suggestion commercialization cannot work. To apply commercialization, we need commercial funds, strategic capacity to ensure commercial management of fund and sustainability. And finally, operational efficiency is required to be ensured through the application of commercial principles in all possible respects. Here, the author strongly believes that if such micro finance program is run under commercial principles, not only the poor folk of the society but also the business world (small scale) will be benefited and the interest rate charged by the NGOs/MFIs will be dropped to a competitive level. It is really unexpected to have some negative comments on commercialization process on the ground of exploitation by charging higher rate of interest where NGOs/MFIs are charging the highest in the name of poverty alleviation.

Insert Figure 8 Approximately Here

12. Prospects of Microfinance

Both developed and developing countries still have a good market for the development and advancement of microfinance industry. Because there is a huge market gap that is required to be filled up to grasp the potential benefits from it. The market is growing, but the pace is very slow. The main reason is lack of commercialization. Here, most of the *NGOs* provide donated funds at a subsidized rate. Transformation rate (from *NGO* to *MFI* to Commercial Bank) is very low. First thing that we need according to our proposed model is conducive regulatory environment to support the microfinance operation. Commercial Banks should be kept free to engage themselves in such operations that are not authorized in many countries. So, Central Bank may form a task force to conduct a feasibility study to evaluate whether full-fledged commercial banks can be given the permission to go for microfinance operation. Grameen Bank, *BRAC* Bank, Islami Bank Bangladesh Limited and some other financial institutions are enjoying the facilities and they are making a good fortune, if we take Bangladesh as a sample. If all banking and non-banking financial institutions avail the option, the breadth and depth of outreach can be maximized. The need for microfinance is higher in rural areas than in urban areas irrespective of the status of the country. Most of our unemployed and unproductive men and women live in rural areas who need works and funds. Sometimes they do not get work due to shortage of fund. Again, there are ample opportunities in rural areas to operate successful venture at minimal fund involvement in various agro-based projects. Indigenous people may also be a target group of microfinance industry who needs training and funds to expose them off. Thus commercialization of microfinance may work as an effective tonic here to bring our poor people out of the vicious circle of poverty. From *NGOs*, we cannot expect the maximum result so long as they will run by donated fund or soft and grant loans. If commercial banks come up with their expertise and commercial funds, the situation may be better. They can use their long trained staff, fund management policies, scattered branches to ensure outreach and last, but not the least, commercial funds with a commercial motive that leads not only to alleviate poverty but also to develop wealth-base of the destitute group. "Latin America is the most commercially advanced microfinance market in the world," says Roy Jacobowitz, vice president for resource development at ACCION, one of the world's largest microfinance institutions. Microfinance in Latin America has been characterized over the years by a clearly profit

driven and competitive landscape that differs widely from the peer-group style lending championed by Grameen Bank of Bangladesh and other Asian and African models. It's a model that has had success in alleviating poverty in the region, helping to develop Third World economies and, more recently, creating a new asset class for private investors interested in a social return as well as a financial return. Thus, the prospect of microfinance is enormous. We can make it what Latin American Countries have already made. What we need is the clear vision and commitment.

13. Conclusion

Micro credit programs have a strongly positive relationship with poverty alleviation; this is the proven fact. But, the only requirement is that the loan giving authorities really mean it. It is not a simple task to help the poor, as they are poor in every respect. The geographical location of the poorest and the broader environment in which they operate also make it more difficult to serve them. For example, while the poorest can be found in urban areas, most of the poorest in Asia are concentrated in rural areas where basic physical infrastructure is highly inadequate (Haan and Michael, 1998). The bulk of the poorest in India are in such states as Bihar (including Jharkhand), Uttar Pradesh (including Uttaranchal) and Madhya Pradesh (including Chhatisgarh) (Mehta and Amita, 2003). These states have seen relatively very little institutional micro finance.

The poor are scattered throughout the remote geographical area where the outreach is so difficult and due to the rapidly increasing number of borrowers, a matured institutional set up is required. So, micro finance is required to be commercialized. Application of commercial principles in micro finance becomes a time demanding issue now a day with the increase in failure rate also. Micro-businesses (defined as those employing less than five people) have a high failure rate and are considered high-risk investments (Dahn, 1992). Micro-business borrowers seek to borrow sums that, because of their small, often non-standard, character, incur disproportionately high transaction costs (Dahn, 1992). Micro finance facility may suit them in such a situation.

Finally, if the group (target market, loan receivers) is identified rightly, if commercial principles can be applied equitably and if the poor are rightly and timely focused, micro finance may work as a strong and timely intervention against poverty that no laboratory can test and prove. It may work as a cause of smile for a vast majority poor people who suffer from acute poverty level in terms of hunger, illiteracy, ignorance, slavery, insecurity and such other in humanitarian condition. And if commercialized properly, small business entrepreneurs may find the program worthy for them also.

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Table 1. Top 10 Microcredit Summit-verified Bangladeshi MFIs, based on number of poorest clients

Source: Daley-Harris (2005)

Micro Finance Institutions (MFIs)	Number of Poorest Clients	Number of Active Clients	Proportion of Active Clients who are poorest	Number of poorest who are women	Proportion of poorest who are women
Grameen Bank	4,060,000	4,060,000	100%	3,897,600	96%
BRAC	3,630,000	3,990,000	91%	3,630,000	100%
Bangladesh Rural Development Board	3,528,041	3,713,728	95%	2,399,068	68%
ASA	2,490,000	2,770,000	90%	2,390,400	96%
Proshika	1,236,104	1,545,130	80%	803,468	65%
Sonali Bank	500,000	3,800,000	13%	365,000	73%
Caritas	251,273	284,947	88%	173,378	69%
Thenamara Mohila Sabuj Sangha	250,664	278,516	90%	238,131	95%
BURO Tangail	221,366	221,366	100%	219,152	99%
Rangpur Dinajpur Rural Service	175,713	228,199	77%	140,570	80%
Total	16,343,161	20,891,886	78%	14,256,767	87%

Table 2. Roles needed for turning commercialization a success

Roles of Government	**Roles of Funding Agencies**	**Roles of *MFIs***	**Roles of *MF* industry support organizations**
1. Providing enabling policy environment 2. Phase out direct interventions that distort the market for microfinance 3. Focus on grant based approaches to assist the poorest 4. Create a new legal structure for commercial MFIs 5. Adopt appropriate regulation and supervision for microfinance 6. Improve the framework for secured transactions	1. Support an effective policy, legal and regulatory environment 2. Build MFI institutional capacity 3. Support innovation in enterprise development 4. Promote linkage development	1. Balance commercial and social objectives 2. Increase cost efficiency 3. Improve institutional capacity	1. Role of PKSF 2. Role of CDF 3. Role of Credit Information Bureau (CIB)

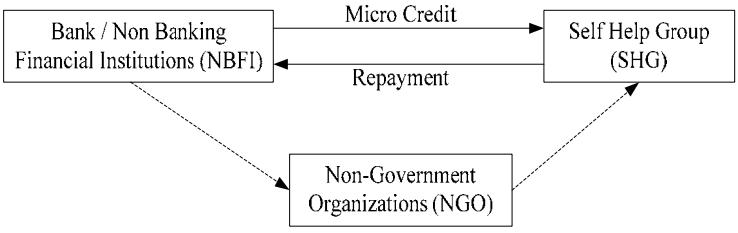

Figure 1. Traditional Micro Credit Model

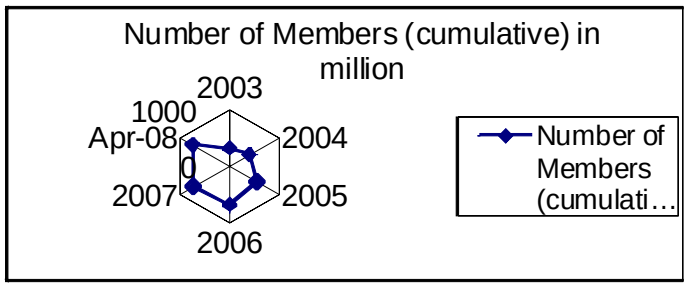

Figure 2. Increasing number of beneficiaries of micro credit

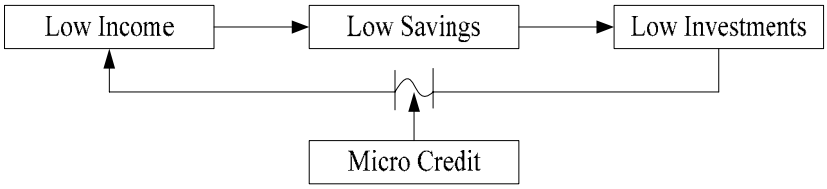

Figure 3. Breaking the Vicious Circle of Poverty: The Grameen Model

Pre-Sanction Phase	Formation of a 5-members group who are homogeneous in terms of age, sex, location, knowledge and social status
	Participation in a weeklong training program to be familiar with the rules and regulations
	Jump to next step if their performance is satisfactory. And if the performance is not up to satisfaction, the process stops here.
Sanction Phase Loan is sanctioned and given to the group	
Post-Sanction Phase	Each member identifies the purpose of the loan consulting with the other members of the group.
	For repayment, each and every member of the group is liable up to the total amount of the loan.
	Mutual accountability establishes a form of social capital replacing financial capital (commercial viewpoint) that ensures the timely recovery of the fund.

Figure 4. Grameen Model of Microcredit – at a glance

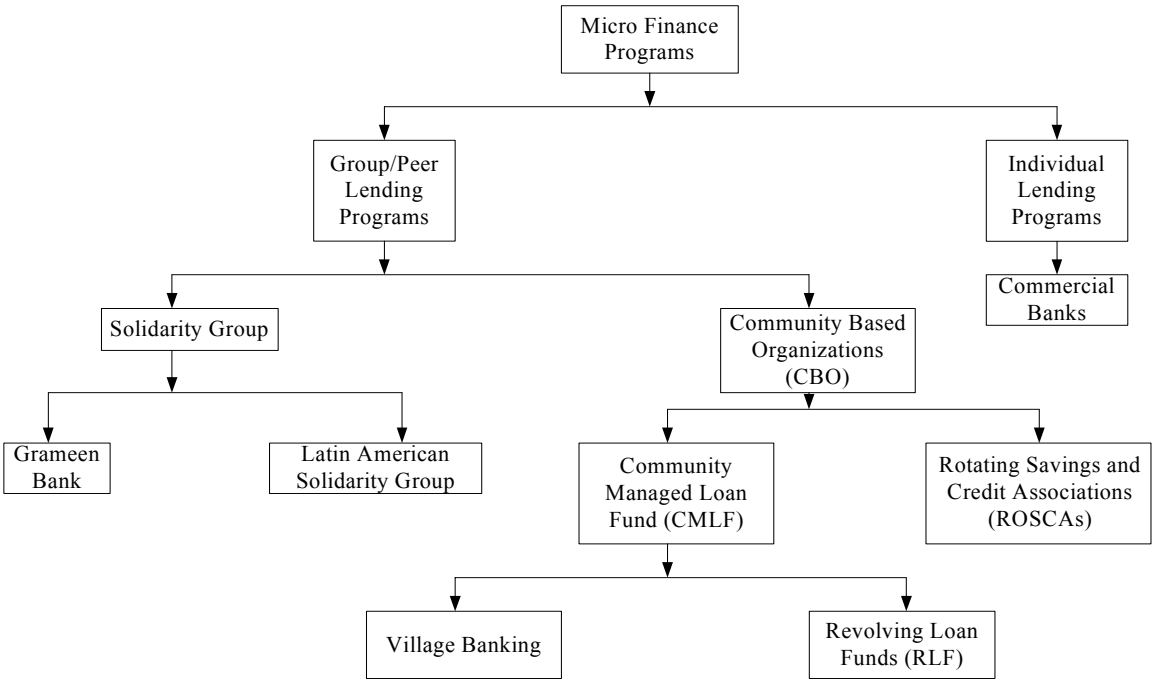

Figure 5. Different Types of Micro Finance Programs

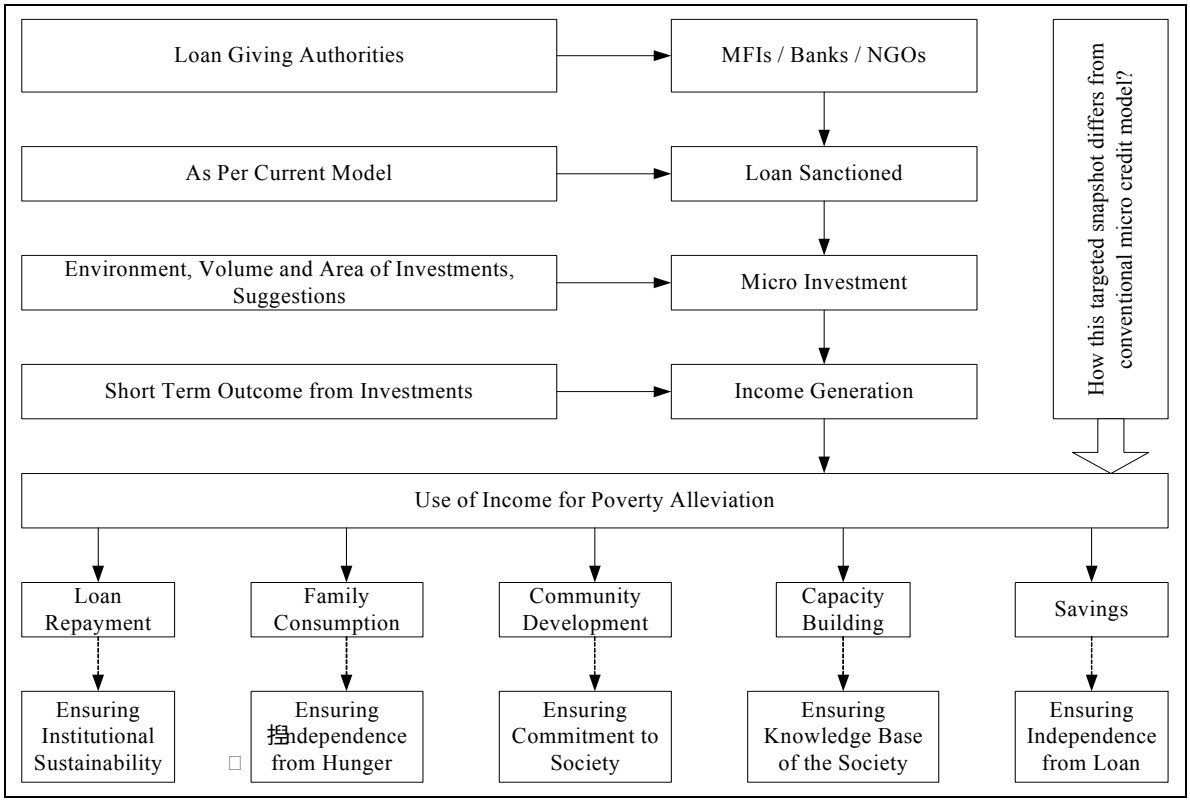

Figure 6. Micro Credit Model for Long-term Poverty Alleviation

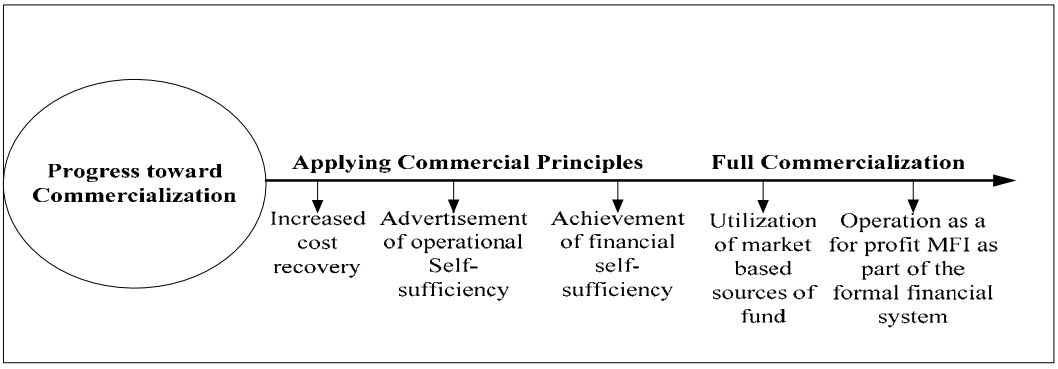

Figure 7. MFI Commercialization Continuum

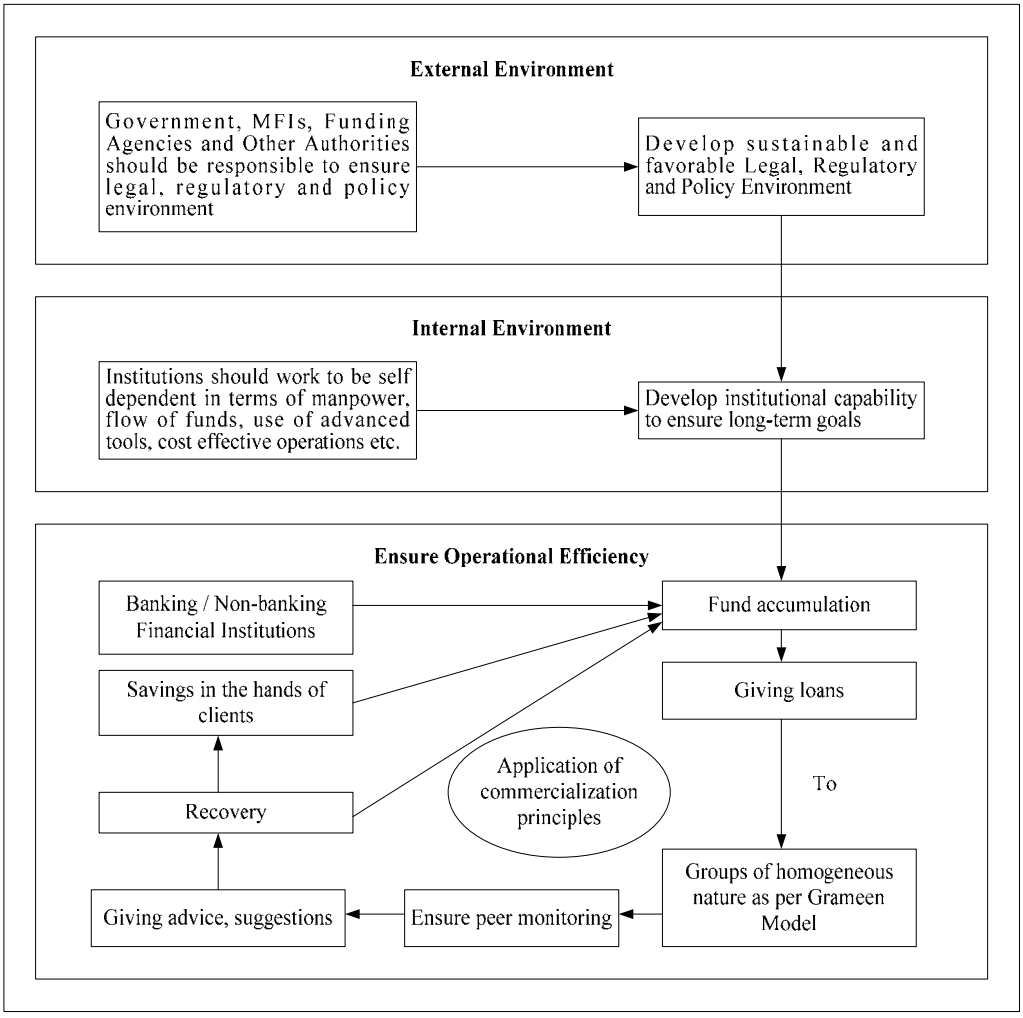

Figure 8. Microfinance Commercialization Model

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Intellectual Capital Efficiency and Firm's Performance:

Study on Malaysian Financial Sectors

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Abstract

It is no doubt that successful companies tend to be those that continually innovate, relying on new technologies and emphasize on skills and knowledge of their employees rather than assets such as plants or machinery. Knowledge being the new engine of corporate development has become one of the great clichés of recent years. Value can be generated by intangibles, which are not always reflected in financial statements. Forward-looking companies have realized that these are an integral part of fully understanding the performance of their business. This study therefore tries to investigate the efficiency of intellectual capital and its performance in Malaysian financial sectors. The results were based on the data taken from 18 companies under financial sector for the year 2007. It was found that the banking sector relied more on intellectual capital followed by insurance companies and Brokerage firms. It was also found that intellectual capital has significant and positive relationships with company's performance measured by profitability and Return on Assets (ROA).

Keywords: Intellectual capital, Value added intellectual capital coefficient

1. Introduction

In Malaysia, the development of human capital, enrichment of the mentality and intellectual capacity of a nation is one of the areas targeted under the Ninth Malaysia Plan. Intellectual capital is defined as intangible assets which include technology, customer information, brand name, reputation and corporate culture that are invaluable to a firm's competitive power (Low and Kalafut, 2002),**).** Hence, intellectual capital consists of (1) tacit knowledge and innovativeness of the employees, (2) infrastructure of human capital (i.e. good working system, innovation) and improvement processes of structural capital and; (3) external relationships of the firm (i.e. customers' capital). These are the key drivers of organization performance and creation of future wealth. (Bontis *et al.*, 2000; Riahi-Belkaoui, 2003). In realizing the goals of a progressive and dynamic financial sector and the desire to become a knowledge-based economy, greater efforts must be directed to building human intellectual capital (Lepak and Snell,1999).

In Malaysia, the role of human capital is pivotal to the development of a world-class capital market. The financial sector is now in a prime position to be more innovative, relying on new technologies and emphasizing on skills and knowledge of their employees rather than on assets such as plants or machinery. This is due to the intense competitive pressure, which arises from changes in the financial environment, technological advancements and the needs of the consumers in terms of product quality. Therefore, financial sectors need to anticipate and respond to these demands and expectations. Hence, highly skilled individuals are needed to facilitate the delivery of high value-added products and services as well as the competencies to build consumers' confidence and trust (Mavridis, 2004).). Moreover, financial sectors such as banking are a knowledge-intensive, skills-based and relationship-rich industry. In an increasingly complex and more liberal environment, the competitiveness of banking institutions will depend critically on the quality of human intellectual capital and the extent to which the industry is able to leverage on these talents.

Although intellectual capital has been recognized as a firm's wealth driver, there are many issues that are still being debated. In addition to the issue of the development of measurement models that best explain the invisible or hidden values of firms, various attempts have been made by companies and countries to develop an intellectual capital disclosure framework to reflect values unexplained by traditional accounting. On the other hand, it is not clear whether certain types of firms are more likely to focus on managing intellectual capital or not, or if they do, do they

view intellectual capital as a mission-critical resource and attempt to manage it accordingly (Usoff, Thibodeau , and Burnaby, 2002). Therefore this study is trying to investigate the intellectual capital efficiencies among companies under financial sectors particularly in the banking, insurance and brokerage firm in Malaysia. In addition, the study also attempts to analyze the relationships between intellectual capital and the company's performance.

2. Method of analysis

The value added intellectual coefficient ($VAIC^{TM}$) introduced by Pulic (1998) was used to measure the intellectual capital efficiency in the current study. Multiple regression analysis then was used to investigate the relationships between intellectual capital (measured by human capital efficiency, structural capital efficiency and capital employed) and firm's performance. Firm's performance on the other hand was conceptualized by looking at the value of Return on Assets (ROA) and company's profitability. Annual reports from 18 companies were chosen to be analyzed which encompasses of banks, insurance companies and brokerage firm.

2.1 Variables

Intellectual capital includes customer capital, human capital, intellectual property, and structural capital. However in this study, intellectual capital was measured by human capital, structural capital and capital employed as suggested by Pulic (1998) and Firer and Williams (2003)**.** *Human capital* refers to the collective value of the organization's intellectual capital - that is competencies, knowledge, and skills. This capital is the organization's constant renewable source of creativity and innovativeness, which is not reflected, in its financial statements. *Structural capital* can be defined as competitive intelligence, formulas, information systems, patents, policies, processes, and etc., resulted from the products or systems the firm has created over time. Structural capital is the intellectual value that remains with the enterprise when people leave. Structural capital includes the content within the enterprise knowledge asset, as well as the intellectual investment that the enterprise has made in the physical, technical and business culture infrastructures that support its activities. *Capital employed* on the other hand can be defined as total capital harnessed in a firm's fixed and current assets. Viewed from the funding side, it equals to stockholders' funds (equity capital) plus long-term liabilities (loan capital). However, if it is viewed from the asset side, it equals to fixed assets plus working capital. (businessdictionary.com).

2.1.1 $VAIC^{TM}$ model

The $VAIC^{TM}$ method enables the firm to measure its value creation efficiency (Pulic, 2001, 2002). $VAIC^{TM}$ method used financial statements of a firm to calculate the efficiency coefficient on three types of capital – that is human capital, structure capital and capital employed. Though $VAIC^{TM}$ uses accounting data, it does not focus on the cost of the firm. It's only focus on the efficiency of resources that create values to the firm (Pulic 2000, Boremann 1999).

Pulic (1998) proposed Value Added Intellectual Coefficient (VAIC) as an indirect measure of efficiency of value added by corporate Intellectual Capital. The $VAIC^{TM}$ method provides the information about the efficiency of tangible and intangible assets that can be used to generate value to a firm. Financial capital (monetary and physical), human capital, and structural capital have been recognized as major components of VAIC. A higher value for VAIC shows a greater efficiency in the use of firm capital, since VAIC is calculated as the sum of capital employed efficiency, human capital efficiency and structural capital efficiency. Pulic (2001) identified that firms' market value have been created by capital employed (physical & financial) and intellectual capital.

$VAIC^{TM}$ of a firm is calculated using the following five steps

Step- 1

Calculation of value added (VA_{it}) by all the resources of the firm during the't' period of time.

Where,

$OUTPUT_{it}$ = Total income form all products and services sold during the period of t

$INPUT_{i}$ = All expenses (except labor, taxation, interest, dividends, depreciation) incurred by firm for the period of t.

Therefore,

$$\mathbf{VAit = OUTPUTit - INPUTit} \quad \mathbf{(1)}$$

The Calculation of value added by a firm during a particular period is based on the Theory of stakeholder view (Donaldson and Preston, 1995 in Pulic 1998). The stakeholder theory suggests that everyone who affects and be affected by what a firm does has an interest (stake) in the firm. In this context "stakeholder" includes not only venders, employees, customers, directors, government, but also members of community as a whole. Therefore, value added by a firm to stakeholders is a broad performance measurement of the firm than accounting profit, which calculates return attributable to shareholders of the firm. According to Riahi- Belkaoui (2003), Value added by a firm during a particular period can be calculated by the following formula (2).

$$\mathbf{R = S – B – DP – W – I – D –T} \quad \mathbf{(2)}$$

Where: R is retained earnings for the period; S is net sales revenue; B is cost of good sold plus all expenses (except labor, taxation, interest, dividends, depreciation); W is employees' salaries and wages; I is interest expenses; D is dividend paid to shareholders; and T is taxes.

$$\mathbf{S - B = DP + W + I + D + T + R} \quad \mathbf{(3)}$$

The left hand side of the above formula shows that total value generated by the firm during a particular period and the right hand side shows how the firm has distributed its generated value among stakeholders, such as employees (salaries and wages- W); debt holders (interest- I); government (taxes- T); shareholders (dividend, retained earning and provision for depreciation- D, R, DP). Therefore, formula (3) can be re-arranged to calculate value added by the firm, by the following formula (4).

$$\mathbf{VA = DP + W + I + D + T + R} \quad \mathbf{(4)}$$

VA_{it} = I_{it} (total interest expenses) + DP_{it} (depreciation expenses) + D_{it} (dividends) + T_{it} (corporate tax) + R_{it} (profits retain for the year)

Following Pulic (2000a, b) and Firer and Williams (2003), the following steps show the calculation of Value Added Intellectual Coefficient (VAIC) and its components such as coefficient of capital employed, coefficient of human capital and coefficient of structural capital.

Step- 2

The calculation of Value Added Capital employed Coefficient ($VACA_{it}$)

$$\mathbf{VACAit = VAit / CAit} \quad \mathbf{(5)}$$

Where,

CA_{it} = Capital Employed = Physical Assets + Financial Assets

= Total Assets - Intangible Assets at end of't' period

$VACA_{it}$ = The value created by one unit of capital employed during the't' period

Step- 3

Calculation of Value Added Human Capital Coefficient ($VAHC_{it}$)

$$\mathbf{VAHCit = VAit / HCit} \quad \mathbf{(6)}$$

Where,

HC_{it} = investment in Human Capital during the't' period or total salary and wage including all incentives

$VAHC_{it}$ = Value added by one unit of Human Capital invested during period of't'

Step- 4

Calculation of the value added structural capital coefficient ($STVA_{it}$)

$$\mathbf{STVAit = SCit / VAit} \quad \mathbf{(7)}$$

Where,

SC_{it} = Structural capital (VA_{it} – HC_{it})

$STVA_{it}$ = the proportion of total VA accounted by structural capital.

Step- 5

Calculation of Value Added Intellectual Coefficient ($VAIC_{it}$)

$$\mathbf{VAICit = VAHCit + VACAit + STVAit} \quad \mathbf{(8)}$$

Where,

$VAIC_{it}$ = Indicate corporate value creation efficiency on firm resources.

⇒ **Value added (VA):**

newly created value, calculated as follows

VA = Operating profit+ Employee costs + Depreciation +Amortization or

VA = OUTPUT (Total income) – INPUT (All costs of purchasing goods and services from the market.)

⇒ **Human Capital (HC):**

Overall employee expenses (salaries, education, training); In this analysis considered an investment, not cost, and thus not substantial part of INPUT any more. Therefore:

Human Capital Efficiency (HCE=VA/HC):

⇒ **Structural Capital (SC):**

Result of Human Capital's past performance (organization, licenses, patents, image, standards, and relationship with customers). Therefore:

Structural Capital Efficiency (SCE=SC/ VA):

⇒ **Capital Employed (CE):**

All material and financial assets.

Capital Employed Efficiency (CEE=VA/ CE):

⇒ **Intellectual Capital Efficiency (ICE=HCE+SCE):**

Indicator which shows how efficiently IC has created value.

Indicator that shows how much VA is created on each monetary unit invested in CE.

⇒ **Value Added Intellectual Coefficient (VAIC^{TM}=ICE+CEE):**

Indicates the value creation efficiency of all resources (sum of the previous indicators). It expresses the intellectual ability of a company, regional or national economy.

3. Results and Finding

Based on the data collected from 18 financial company's annual reports listed in Bursa Malaysia for the year 2007, frequency analysis was done on the company's assets, profitability and number of employee (refer to Table 1 below). On average, Commercial banks followed by brokerage firms and insurance company were having the greatest amount in terms of its asset value, net profit and number of employees. These results might influence the findings of the current study in terms of their intellectual capital efficiency and it's relation to firm's performance.

3.1 Intellectual Capital Efficiency

Based on the calculation shown in table 2, the results of the current study found that, in terms of Intellectual Capital efficiencies among commercial banks, Public Bank has the highest efficiency ranking with VAIC^{TM} of 10.78, followed by Maybank, AMMB Holdings Berhad and Affin Holdings Berhad. The least efficient bank is Malaysia Plantation Holdings Berhad with VAIC^{TM} of 3.47. VAIC^{TM} of 10.78 means that, for every RM1 value invested, RM10.78 million was contributed form intellectual capital efficiency. In terms of human capital efficiency, Public Bank was also dominated with VAHC of 9.82, followed by Maybank, AMMB Holdings Berhad and Affin Holdings Berhad. VAHC of 9.82 means that for every RM1 invested, Public Bank created RM 9.82 million from its human capital. Public Bank was also the best performer for structure capital efficiency measured by STVA. However, for Capital employed (VACA), Maybank was dominated with VACA value of 0.06, followed by Public Bank. As a whole, banks in Malaysia have relatively high Value added human capital (VAHC), compared to Value added capital employed (VACA) and value added structural capital efficiency (STVA).

Being efficient alone is insufficient, as the company must also show that they have the capability to create value. Though Maybank was the second in terms of Intellectual capital efficiency, it created the highest added value of RM 13,030,850 million, which ranked as first of six commercial banks. This is due to its highest value of capital employed that contributed to high value added.

For Insurance companies, in terms of efficiency in utilizing human capital, LPI Capital Berhad topped the list with a VAHC of 8.30, followed by Pacificmas Berhad, Allianz General Insurance Malaysia Berhad and Jerneh Asia Berhad.. With regards to VAIC^{TM} ranking, LPI Capital Berhad has the highest efficiency ranking with VAIC^{TM} of 9.46, followed by Pacificmas with VAIC^{TM} of 4.56, Allianz General Insurance Malaysia Berhad with VAIC^{TM} of 3.30 and Jerneh Asia Berhad with VAIC^{TM} of 3.04. As a whole, insurance bank in Malaysia have relatively high VAHC, compared to VACA and STVA.

Based on the VAIC^{TM} ranking for brokerage firm, it shows that Kaf Seagroatt & Campbell Berhad is on the top of the list with VAIC^{TM} of 7.65. Seagroatt & Campbell Berhad have a higher efficient in utilizing their human capital, structural capital and capital employed followed by TA Enterprise Berhad. Eventhough OSK Holdings Berhad was in the fourth ranking, this company has created a highest value which is RM 352,380 million followed by TA Enterprise Berhad with VACA of 0.10.

Overall, for the year 2007, the VAIC results shows that commercial banks is the most efficient in terms of utilizing their intellectual capital compared to insurance company and security brokerage firms. Table 2 below shows the result from the analysis of VAIC.

3.2 Relationships between Intellectual Capital and company's performances

In measuring the relationship between intellectual capital and company's performance, multiple regression analysis was used. The results found that the relationship exists between intellectual capital efficiency and performance (measured by profitability and ROA). The relationships between Intellectual Capital (VAIC) had shown positive and significant relationships with both ROA and Profitability. From the results in table 3 below, it indicates that when intellectual capital increase by one percent, the company's profitability increased by 13 percent and ROA increased by 53 percent. However, Human Capital and Structure capital is insignificant and shows negative relationships with Profitability and ROA. It means that Human Capital and Structure capital efficiency does not influence the profitability of the company. However, Capital employed efficiencies shows positive and significant relationships with company's profitability and ROA.

4. Discussion and conclusion

With the globalization, organizations are increasingly confronted with worldwide competition. In order to build and sustain their competitive advantage, the knowledge and expertise of an organization, staff needs to be seen as a critical strategic resource.

The purpose of this empirical study is to investigate the efficiency of the three elements of intellectual capital in the financial sector, i.e. human capital, structural capital, and capital employed and its relationships with company's performance. The study was conducted using the data from 18 companies annual reports listed from Bursa Malaysia. The method of analysis used was the one introduced by Pulic (1998,2000,2001). The main conclusions from this particular study are: Intellectual capital has greater influence in banking institution compared to insurance company and security brokerage companies. Based on the measurement using VAIC™ method, banking institutions shows the highest result in efficiently utilizing their intellectual capital especially in human capital compared to insurance companies and securities companies in year 2007. Public Bank shows the highest intellectual capital efficiencies compared to the others companies under financial sector in Malaysia. However, in terms of total corporate value added, the companies with high capital employed shows high total value added, for example Maybank, LPI capital and OSK holdings. It can be concluded that, in Malaysian financial sectors, market value have been created more by capital employed (physical & financial) rather than intellectual capital.

The findings of the study is consistent with the previous study (e.g. Goh, 2005), where he found that for banks in Malaysia, those with good financial performance as measured by the traditional measures may not have high value added in terms of intellectual capital. According to Goh (2005), who examined the intellectual capital performance of commercial banks in Malaysia for the period of 2001 to 2003. He found that there is a significant difference between rankings of banks according to intellectual capital performance/efficiency that measured via VAIC™ and traditional performance, which represented by assets, net profit and shareholders' equity. The results indicated that Maybank, which is the largest bank in terms of assets, net profit and shareholders' equity, had a lower intellectual coefficient. In the same study, he also found that the performance of human capital is higher than those of structural and physical capital for both domestic and foreign banks in Malaysia.

In terms of inter-relationship between company's performance measured by Profitability and ROA, the current study found that, overall intellectual capital has positive and significant relationships with Profitability and ROA. However, human capital and structural capital has no significant relationships with company's Performance. The reasons may be due to the fact that profitability may be influence more by other financial factors such as sales volume and how the company manages their expenses rather than non-financial factors. Another possibility is that, the human capital efficiencies might be used for other agendas which is not align to organizational goals; furthermore the measure of human capital using VAIC™ method might be flawed as it doesn't actually measure the value added of the human resources; in fact all it measures is the value added per $ wages - which can be attributable to other resources. Capital employed on the other hand shows positive relationship with business performance as capital employed was determined by the usage of the tangible assets. However, the findings of the study was consistent with Bontis , Keow and Stanley (2000) who also found that intellectual capital influence the performance of the company although not all elements contribute to the efficiency. In contrast to the study done by Ranjith (2007), who measure company's performance by capital gain on shares, found that Intellectual Capital shows a significant positive relationship with capital gain shares and both structural capital and human capital efficiency have positive relationship with capital gain on shares. However, capital employed efficiency shows significant negative relationship with capital gain on shares.

The current study has it limitation in terms of its samples (which is only 18 companies). Therefore, it is unfair to generalize the findings for all financial sectors. Hence the external validity is very weak. This is due to the difficulty in getting consistency of all-relevant information for all companies. For future research, it is recommended that, more companies should be used. Future research can also compare other measures of intellectual capital efficiency with VAIC model and gauge more valuable output.

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http:///www. businessdictionary.com

Table 1. Selected financial sectors value of assets, net profit and number of employees for year 2007

		Asset (RM '000)	Net profit (RM '000)	Employee
Commercial Banks				
1	AMMB Holding Berhad	72,260,637	479,040	9280
2	Affin Holdings Berhad	35,483,992	226,918	3777
3	Malaysia Plantations Holdings Berhad	23,581,197	-201,424	3676
4	Malayan Banking Berhad	224,205,326	2,865,764	23147
5	Public Bank Berhad	147,789,543	1,795,161	13396
6	RHB Capital Berhad	103,309,975	595,897	10356
Insurance Company				
1	Allianz General Insuranc Malaysia Berhad	2,178,123	34,961	1196
2	Jerneh Asia Berhad	821,624	15,662	479
3	LPI Capital Berhad	754,690	78,128	328
4	MAA Holdings Berhad	7,167,226	-1,662	3245
5	Pacific & Orient Berhad	628	-11	610
6	Pacificmas Berhad	1,277,318	38,487	425
Brokerage Firm				
1	Pan Malaysia Capital Berhad	461,947	12,447	249
2	Hwang- DBS(Malaysia) Berhad	1,253,596	40,503	663
3	K & N Kenanga Holdings Berhad	1,593,033	35,600	831
4	Kaf Seagroatt & Campbell Berhad	290,616	11,827	106
5	OSK Holdings Berhad	3,816,941	131,094	1405
6	TA Enterprise Berhad	2,381,692	89,046	846

Table 2. Result from the analysis using VAIC™ for year 2006

VAIC ranking		VAIC	VACA	VAHC	STVA	VA (RM'000)	VA ranking
Commercial Bank							
1	Public Bank	10.78	0.05	9.82	0.90	7,973,105	2
2	Maybank	9.34	0.06	8.40	0.88	13,030,850	1
3	AMMB	7.50	0.04	6.61	0.85	3,040,520	4
4	Affin	7.42	0.04	6.53	0.85	1,446,520	5
5	RHB	6.65	0.04	5.78	0.83	4,190,375	3
6	Malaysia Plt	3.47	0.03	2.80	0.64	701,021	6
Average		**7.53**					
Insurance Company							
1	LPI Capital	9.46	0.28	8.30	0.88	214,637	1
2	Pacificmas	4.56	0.09	3.74	0.73	112,801	3
3	Allianz	3.30	0.06	2.62	0.62	131,804	2
4	Jerneh	3.04	0.08	2.38	0.58	68,360	5
5	MAA	2.66	0.01	2.12	0.53	94,651	4
6	Pacific & Orient	1.44	0.05	1.22	0.18	30,934	6
Average		**4.08**					
Security Brokerage							
1	Kaf Seagroatt	7.65	0.10	6.69	0.85	30,196	5
2	TA Ent	5.22	0.10	4.35	0.77	245,374	2
3	Pan Malaysia Cap	4.21	0.09	3.41	0.71	28,028	6
4	OSK Holdings	4.16	0.10	3.36	0.70	352,380	1
5	Hwang- DBS	3.25	0.10	2.54	0.61	111,738	3
6	K & N Kenanga	2.88	0.07	2.26	0.56	102,314	4
Average		**4.56**					

Table 3.The result of regression analysis

	PROFITABILITY	**ROA**
F value	77.738***	593476.44***
R square	0.947	1.00
Adjusted R square	0.935	1.00
F change	77.738***	593476.44***
Durbin Watson	1.316	1.866
T value – VACA	15.028***	1354.716***
VAHC	-0.182	-1.323
STVA	-0.709	1.187
VAIC	13.152***	52.497***

***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level

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Study on Cross-Administration Innovation System of the Yangtze River Delta

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Abstract

Since the decentralization of China, regional governments have got more power on how to allocate their investment and set the performance criteria for economic sectors. Strengthened by the regional specific culture, geography and language, administration-based regional innovation system developed quite rapidly in China with great diversity. But with the development of the regional economy, when the traditional administrative division overemphasizes this local benefit to prevent innovation essential factors from flowing and restrict innovation efficiency, the innovation system must surmount the administrative division to carry on innovation in an appropriate region. According to analysis of the yearbooks of Jiang and Zhe provinces and Shanghai, we discovered that the Yangtze River Delta CARIS is a developing model that is a core impetus and supplementary coexisting model and meanwhile a circle proliferation model. Through the research of innovation system in the Yangtze River Delta, the establishment of CARIS is hardly needed in China for the reason of special administrative divisions. Meanwhile, some suggestions are given about how to promote the cross-administration innovation system.

Keywords: Cross-administration, Regional innovation system, The Yangtze River Delta, Systematical interaction

1. Introduction of CARIS

1.1 Origin of CARIS

Since the decentralization of China, regional governments have got more power on how to allocate their investment and set the performance criteria for economic sectors. Strengthened by the regional specific culture, geography and language, administration-based regional innovation system developed quite rapidly in China with great diversity. But with the development of the regional economy, when the traditional administrative division overemphasizes this local benefit to prevent innovation essential factors from flowing and restrict innovation efficiency, the innovation system must surmount the administrative division to carry on innovation in an appropriate region. Through the research of innovation system in the Yangtze River Delta, the establishment of CARIS is hardly needed in China for the reason of special administrative divisions.

1.2 Development of model

The framework of CARIS includes innovation power from the enterprises as the main body, the government function as suitable guidance role, the equal network relations among the innovation main bodies, close cooperation among Enterprises, Campuses and Research Institutes and good innovation environment based on the rich social capital and so on. According to system theory of the urban system and space research, Haggett proposed evolutionary process among areas belonging to the CARIS may be analyzed from 6 factors such as: “the interactions”, “the network”, “the node”, “the rank system”, “the surface” and “the proliferation”. Each region becomes the node of the CARIS, and interacts in the network system forming process. The layers with different ranks are possibly formed according to the local development level, and the prominent nodes also possibly become the central shaft of the network diffusing to other nodes. Profiting from the research summary of Chinese urban regional structure (Yan Xiaopei 1994) and analysis of the urban primacy ratio, the urban system may be divided into types as the double pole type, balanced type and the polar

nucleus type and so on. For this concept, we may generalize the development models of the CARIS as follow types: Core impetus type, equal network supplementary type, core impetus type and supplementary coexisting type as well as layer and network type and so on. Certainly, with the characteristic about different regions and the different development phases, the CARIS is usually mixed up by many types of development models.

2. European Union's, Korean and Japanese instance analysis

2.1 European Union: Strengthen International scientific and technological cooperation

The European Union treaty subscribed in 1993 proposed that one of four big essential targets of European Union was to well develop and make use of the innovation, the research and technical achievements with the latent commercial value. In 1994, European Union has formulated the fourth framework program for research and the technical development, and invested 13.1 billion Euro in 20 plans for technical cooperation campaign which includes 4 fields such as the R&D and demonstrating, the international technical cooperation, promotion of the research and the researchers training. Large quantities of European Enterprises and the research organizations were involved in this plan, thus the supranational large-scale science plan including a variety of participations like countries' governments, the scientific and technical departments and the business communities has formed. In 1997, European Union Committee also proposed the fifth R&D framework program emphatically engaging in research for the life and the ecology science, the information technology as well as the sustainable development technology. In 2001 the sixth framework program was promoted, and the goal is to serve the construction of the European research area. Meanwhile it proposed seven big projects giving priority to develop, like the biological technology and so on.

(1) Guarantee the innovation policy identical

(2) Establish one management framework in favor of innovation

(3) Encourage establishment and development for innovation enterprises

(4) Improve essential agency in innovation system

(5) Japan: Establish region information cluster taking city as central

Japanese Government announced "the science and technology fundamental law" in 1995, and this became the basic law of science and technology policy in Japanese. Japanese Government has successively formulated two five-year plans "the science and technology basic plan" (1996-2000 and 2001-2005). Aiming at the regional science and technology these mainly facilitates to cause the region "the information cluster" and the smoothly implement regional science and technology policy.

2.1.1 The policy taking establishment of the information cluster and the industrial cluster as goal

The information cluster is technology innovation system that a set of enterprises participate in a region inside and outside taking research task and important public research institutions as a core. Ministry of Education, Culture, Sports, Science and Technology had designated 12 implementation regions in April 2002 and it started to implement in July 2002, more 3 regions in February 2003. Ministry of Economy, Trade and Industry implemented the industrial cluster plan to take each bureau of economy and industry as a point to institute the production, study and office network facing enterprises and universities in worldwide market. With local authority's support, 19 industrial cluster projects have been implemented. About3800 small and medium-sized enterprises as well as 200 universities participated composing the cross-region network.

2.1.2 Various region innovation policies

The region innovation policy mainly concentrates on the aspects below: a. The encouragement system, including all the correlation policies promoting regional innovation in Ministry of Internal Affairs and Communications, Ministry of Education, Culture, Sports, Science and Technology, Ministry of Economy, Trade and Industry, Ministry of Agriculture, Forestry and Fisheries and Ministry of environment; b. The improvement and operation of research achievements trading market, such as establishment of applying market to commercialize the research achievements in Hokkaido and other cities; c. the improvement of the research facilities to promote the regional science innovation; d. Strengthens R&D and technical support of the public experimental study organizations, including the support from Japanese Ministries to R&D centers in state administration at different levels; e. Interaction and communication among regions including regional science innovation conference, research and communication among legal persons of each financial group in entire Japanese Region, as well as industrial technology advancement conference and so on..

2.2 Korea: Establish the multi-layer city innovation system

From 1995 Korea started to strengthen the research and the policy system establishment of the regional innovation system. Because the regional scope is small, the culture and system are with the strong homogeneity and the policy conduction function is effective. Therefore R&D in many regions is dynamic and flexible well impelling innovation campaign. The construction and implementation of regional innovation system is easier than the national innovation

system, and can provide a good foundation for the construction of high effective national innovation system.

Korean regional innovation system is divided into three kinds: Developed, developing and less-developed regional innovation system. In the developed regional innovation system, the distribution in both relative and absolute quantity of each innovation main body is reasonable. In the developing region innovation system, there are some flaws inside, but also it improves in the near future, especially, the quantity of public research facilities in this region is small. In less-developed regional innovation system, there is some big problem in its construction.

3. Establishment of the Yangtze River Delta CARIS

The Yangtze River Delta economic region with Shanghai as core, now has became the biggest foreign capital inflowing region and also the most conditional area in China that can takes part in the global division of labor. In north, the regions such as Beijing, Tianjin, Tangshan and economical belt at Gulf of Bo Hai also lead the development of the northwest areas and peripheral regions through its incomparably political center superiority and the abundantly economic potentiality.

Insert Figure 1 Here

Through the research of the Yangtze River Delta RIS, we discovered that the Yangtze River Delta CARIS is a developing model that is a core impetus and supplementary coexisting model and meanwhile a circle proliferation model. Display as follows: (1) Shanghai as the Yangtze River Delta center plays a good demonstration role in driving the development of Jiang and Zhe provinces, including: as a center of economy and resources, taking the lead of making policy and system, research and development, shipping, finance and trade centers and so on; (2) absorption and radiation of Shanghai to peripheral regions: it Includes absorption to talents and the fund resources from Jiang and Zhe provinces to Shanghai taking FDI as an example to reflect Shanghai radiation degree to the peripheral regions (3) supplementary function of Jiang and Zhe provinces to Shanghai: it reflects from aspects manifesting as industrial structure, resources and infrastructure construction and so on.

3.1 The core role of Shanghai

Shanghai is most developed city in Chinese economy, and its regional gross product, value-added of secondary and tertiary industry, total investment in the fixed assets, total volume of the retail sales of social consumer goods, total volume of imports and exports, the total volume of exports, the actually utilized foreign capital, etc as the main economic indicators are all in the first level in Chinese cities.

Insert Table 1 Here

As a center manifested in four aspects like economy, trade, finance, shipping, Shanghai, as the internationalization metropolis and the core of the Yangtze River Delta, has attracted the multitudinous innovation resources by the absolute superiority. At present, only Pudong block in Shanghai has already gathered 7 big state-level essential factors market for instance, negotiable securities, futures, shipping, technology, property right, talented persons and commodities and so on. There are more than 340 Chinese and foreign financial organ, more than 60 multinational corporation headquarters and more than hundred domestic big enterprise group headquarters, moreover, also some more than 100 multinational corporations research and develop centers and the domestic enterprise technological innovation centers and more than 4000 organizations in many kinds of professional service and so on, so that these become a core carrier for Shanghai to construct the international center with economy, trade, finance and shipping.

3.2 Absorption and radiation of Shanghai to peripheral regions

In the Yangtze River Delta CARIS, revolving Shanghai as a core, there also has formed some convergency and diffusion concretely represent in absorption and radiation of Shanghai to peripheral regions. Revolving the growth pole, in this region, several economic potentiality layers have been formed (chart 1). Economy is proliferated by the spatial shape.

Foreign direct investment (FDI) reflects opening degree and influence of Shanghai to other cities in this region. From Table 2, in Figure 1 we may see that the nearer to Shanghai the city is, the more FDI he gets. Foreign direct investment in the first layer is obviously higher than it in the second and third layer. The degree of dependency of Jiang and Zhe provinces to Shanghai also reflected radiation and driving function of Shanghai to the peripheral cities.

Insert Figure 2 Here

Insert Table 2 Here

3.3 Undertaking and supplementary between peripheral industry and Shanghai industry

In the Yangtze River Delta, besides driving function of Shanghai to the peripheral region, among layers there are great complementarities in industry, for instance, industrial and infrastructure construction supplementary and so on.

With the economic development of Pudong block from 90s, Shanghai adjusted the development strategy to concentrate

on developing the high-tech industry like aeronautice and astronautics technologies, telecommunications and information technologies, new material and micro electron etc, these lead to emergence of new industry and substitution of leading industries, with the upgrade of Shanghai industrial structure, Jiangsu Province as a role of technical supplementary carried on undertaking Shanghai's traditional manufacturing industry, the radiation and diffusion of Shanghai's new and high technology naturally form the complementary technology connection between urban cities of Jiang and Zhe provinces and a complete set of industries among the interurban. Therefore, with promoting Shanghai industrial structure upgrade, Jiangsu has carried on undertaking adjusting its industrial structure forming the development situation of supplementary industries. Such as Su, Xi, Chang as well as Kunshan all have established the state-level high and new technology development zone one after another; Suzhou built the cooperation development industry zone between china and Singapore, Zhejiang has formed the massive economical industrial cluster, like Ningbo' oil and chemistry industry cluster, Shaoxing's textile industry, Ningbo's apparel industry and so on.

Insert Table 3, Table 4 Here

3.4 Inter-regional cooperative innovation in the trinity of enterprises, campuses and research institutes

An important aspect of construction of regional innovation system in the Yangtze River Delta is that inter-regional cooperative innovation in the trinity of enterprises, campuses and research institutes. Shanghai is the most intensive place in R&D in this region. From a point view of patent cooperation inside the region (see table 5), cooperative patents between Jiangsu and Zhejiang enterprises and Universities of Shanghai are most, this can be explained by that Jiangsu and Zhejiang paid attention to use Shanghai's universities resources to carry on the innovation cooperation, research and development centers in Shanghai display the core role in cooperative and supplementary.

In 2003, inside the Yangtze River Delta the number of patent cooperation accounted to 76 and the aggregate number is 194. (see table 6 and table 7) The number of cooperation patents among Beijing, Tianjin and Hebei is only 30 just taking 15.7% of that (191) between the Yangtze River Delta and neighboring provinces. This sufficiently certificates the breadth of patent cooperation of the Yangtze River Delta.

Insert Table 5, Table 6, Table 7 Here

3.5 Construction of integrated infrastructure

In the construction of integrated infrastructure, the Yangtze River Delta CARIS also takes Shanghai as the center, Jiangsu and Zhejiang provinces as two wings, and mutual supplementary among them will form a perfect infrastructure system. Taking the construction of harbor for example, in the Yangtze River Delta the connection between Chinese backland and overseas is always realized through the Shanghai international shipping center and the combination ports "Shanghai - - Ningbo - - Zhoushan" and so on, and most transportations are contributed as the result of harbor cooperation. So it is known that Shanghai as international shipping center that could not play the role of international shipping center function only depending on own conditions without Jiangsu and Zhejiang provinces.

4. Evaluation and Suggestion

4.1 Evaluation

4.1.1 Evaluation of the recent RIP of the city of Shanghai

Ⅰ Constantly promote and perfect motivation policy for innovation and development of Shanghai.

Ⅱ Promote innovation cluster to strengthen the competitiveness and superiority.

Ⅲ Actively implement the support plan to encourage innovation of the small and medium-sized enterprises (SMEs).

4.1.2 Evaluation of regional innovation and corporation

Ⅰ The reserve of regional innovation is not enough

Although the Yangtze River Delta in China is the most dynamic region with the greatest economic power and also is the more centralized area with scientific research institutions and universities, the economic power for R&D in Jiangsu and Zhejiang except Shanghai is obviously low.

Insert Table 8 Here

Ⅱ The selfishness inclination of local government

Ⅲ The imperfect system of the science and technology innovation service agencies

At present, there are not the science and technology innovation service agencies with high level and great scale in the Yangtze River Delta, the existing agencies is of small scale and few service items; The quantity of promotion centers in the Yangtze River Delta for productive forces amounts to less than tenth of national quantity. This quantity is not compatible with the huge quantity of small and medium-sized enterprises, and the perfect system of agencies has not been founded.

Ⅳ Scattered layout of the science and technology resources, lack of linkage in region

There are plenty of problem in division of labor and joint development and cooperation for national projects in the Yangtze River Delta. We must rectify and standardize the order of the market economy and establish a social credit system compatible with a modern market economy. We must get rid of trade monopolies and regional blockades to allow free movement of goods and production factors on markets around the country.

4.2 Suggestion

4.2.1. Government should take active suggestion to promote the institution innovation and cooperation and co-prosperity among cities in the Yangtze River Delta

Ⅰ Strengthen urban agglomeration's cooperation and impel integration process of the Yangtze River Delta

Ⅱ Enhance study and communication among urban agglomeration governments and make the governments to clearly know their roles in regional innovation system

4.2.2. Strengthen the internal and external linkage of enterprises in the Yangtze River Delta

Enterprises in market all have desires for technology innovation and the key task is to build convenient channel for technology innovation.

Ⅰ Promote the optimization of industry structure and raise the industry concentration ration

Ⅱ Improve the financial radiation and leading role of Shanghai further

4.2.3. The scientific research institute and university are the guarantees of technology innovation in the Yangtze River Delta

Ⅰ Further strengthen the relationship between enterprises with the scientific research institutes and promote the communication between enterprisers with researchers

Ⅱ Taking information technology application as method, build the information platform of technology resources among the urban agglomeration in the Yangtze River Delta

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Table 1. Chief indexes of many cities in the Yangtze River Delta in 2004

City	Regional domestic production (100 million Yuan)	per capita GDP (Yuan)	Investment in fixed assets nationwide (100 million Yuan)	Total volume of the retail sales of social consumer goods (100 million Yuan)	Total volume of exports&imports (100 million dollar)	Total volume of Exports(100 million dollar)	Actually utilized foreign investment (100 million dollar)
Shanghai	7450.27 (25.89%)	55090 -------	3084.66 (22.62%)	2454.61 (29.72%)	1600.26 (39.88%)	735.2 (35.30%)	65.41 (21.93%)
Nanjing	1910	33050	1201.88	711.44	206.39	104.6	15.12
Zhenjiang	781.16	29235	320.5	192.05	34.79	15.19	12.2
Wuxi	2350	52825	1114.13	579.21	218.46	110.22	19.48
Suzhou	3450	57992	1554.80	625.10	1032.01	507.74	95
Hangzhou	2515	38858	1205.18	704.34	244.96	151.75	14.1
Ningbo	2158.04	39045	1095.7	595.63	261.13	166.90	21.03
The Yangtze River Delta	28775.42	35040	13637.93	8258.59	4012.56	2082.96	298.245
Data source: statistical yearbooks of 2005 of shanghai city, Zhejiang and Suzhou provinces							

Table 2. Diffusion effect of Shanghai to periphery economic layer- - - foreign direct investment (FDI) comparison (unit: Ten thousand US dollars)

economic layer		1998	1999	2000	2001	2002	2003
The core layer	Suzhou	285626	285626	288338	302183	481398	680511
	Wuxi	100061	100061	108240	135746	174019	270057
	Hangzhou	38425	42025	43093	50324	52186	100850
	Ningbo	50329	52035	62186	87446	110502	172727
	Average	119110	120437	125964	144425	205027	306537
The second outer layer	Nanjing	87247	87247	81277	90205	150162	220871
	Jiaxing	12128	12300	15318	27067	44435	79682
	Shaoxing	11593	7789	10474	15777	38167	74271
	Changzhou	62569	62569	55977	62036	56120	85522
	Zhenjiang	50840	50840	28925	32637	50095	80552
	Average	68697	68236	63587	74429	108801	169487
The third outer layer	Yangzhou	8129	8129	6654	9968	25580	48097
	Nantong	30705	30705	14292	17523	23848	73092
	Zhoushan	658	869	1055	1097	493	1704
	Average	13164	13234	7333	9529	16640	40964
Data source: statistical yearbooks from 1999 to 2004 of Shanghai, Jiang and Zhe provinces.							

Table 3. The top ten industries of Shanghai Manufacturing Sector

2002	Percentage of production value	2003	Percentage of production value
Electronics and telecommunications industry	12.58	Electronics and telecommunications industry	18.70
Transportation facilities	12.17	Transportation facilities	15.31
Black metal smelting and rolling	9.44	Black metal smelting and rolling	7.72
Electronic devices	6.88	Machinery manufacturing industry	6.69
Chemical materials and chemicals	6.68	Electronic devices	5.82
Machinery manufacturing industry	5.08	Chemical materials and chemicals	5.54
Metal products	4.23	Petroleum processing	5.04
Chemical fibre industry	3.78	Metal products	3.49
Textile	3.68	Textile	2.70
Apparel and other fiber industry	3.27	Professional equipment	2.46

Table 4. The top ten industries in Suzhou Province

2002		2003	
Textile	11.10	Electronics and telecommunications industry	14.39
Electronics and telecommunications industry	10.23	Textile	10.14
Chemical materials and chemicals	9.81	Chemical materials and chemicals	9.21
Machinery manufacturing industry	6.85	Black metal smelting and rolling	6.85
Electronic devices	6.69	Machinery manufacturing industry	6.55
Transportation facilities	5.40	Electronic devices	6.19
Black metal smelting and rolling	5.40	Transportation facilities	5.42
Apparel and other fiber industry	4.07	Metal products	4.22
Metal products	3.88	Professional equipment	2.95
Nonmetallic minerals products	3.56	Electric power and stream, hot water product and supply industry	2.88
Source: national industry statistical yearbooks from 2000 to 2004.			

Table 5. The number of corporation patent between Shanghai and other regions

Place	Shanghai province			Jiangsu province			Zhejiang province		
Mechanism type	Enterprise	University	Academy	Enterprise	University	Academy	Enterprise	University	Academy
Shanghai Enterprise	106	19	18	8	0	1	3	0	0
Shanghai university	109	3	9	11	1	0	6	3	0
Shanghai academy	28	13	12	0	1	0	4	0	0
Source: provided by the State Intellectual Property Office									

Table 6. Three kinds of patents and corporation application in 2003(unit: piece)

	Person	Enterprise	University	Academy	Others	Corporation (proportion)	Total
Beijing	1772	1543	857	772	18	306(5.8%)	5233
Tianjing	362	816	303	53	0	23(1.5%)	1555
Hebei	410	88	17	1	0	14(2.7%)	525
Shanghai	821	1215	967	403	4	269(7.4%)	3632
Jiangsu	868	586	403	65	37	51(2.5%)	2009
Zhejiang	984	394	371	32	4	72(3.9%)	1844

Table7. Corporation application of three kinds of patents in the Yangtze River Delta and the Beijing-Tianjin-Tanggu(BTT) (unit: piece)

Region	Total	In province	With neighboring provinces	With Other provinces	Total of neighboring and other provinces	Total of Neighboring provinces	The Beijing-Tianjin-Tanggu (BTT)
Shanghai	432	317	38	77	115	90	76
Jiangsu	112	77	24	11	35		
Zhejiang	106	62	28	16	44		
Beijing	426	269	21	136	157	30	30
Tianjing	34	15	3	16	19		
Hebei	20	5	6	9	15		
Source: provided by the State Intellectual Property Office							

Table 8. Scientific & Technological Activities by Region in the Yangtze River Delta

Index	2000	2002	2003	2004
The proportion of R&D expenditure in GDP(%)				
National Average	1.00	1.23	1.31	1.44
Shanghai	1.69	1.89	2.06	2.29
Jiangsu	/	1.03	1.21	1.38
Zhejiang	0.87	0.83	1.17	1.28
the proportion of technological development expenditure of large and medium-sized enterprises in the sales revenue(%)				
National Average	1.65	1.73	1.52	1.49
Shanghai	1.57	1.52	1.31	1.82
Jiangsu	/	/	1.12	1.27
Zhejiang	0.53	/	0.66	0.63

Source: *china statistical yearbook, Shanghai statistical yearbook, Jiangsu statistical yearbook, Zhejiang statistical yearbook* (several issues for all)

Figure 1. The Yangtze River Delta

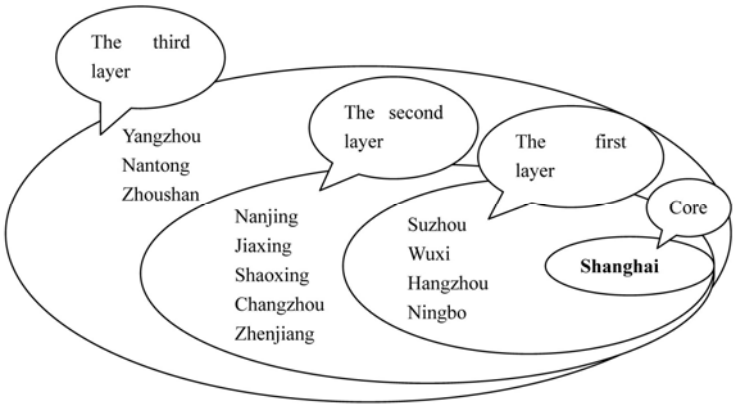

Figure2. The economic layer structure in the Yangtze River Delta

Description for the above figure

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Influence of Economic Factors on Performance of Investment and Mudharabah Accounts in Maybank, Malaysia

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Abstract

This study examines relationship between investment and Mudharabah accounts in Maybank with economic factors. The data used are secondary data from various annual reports of Maybank from 1996 until 2007. The data are analyzed using Correlation and Multiple Regression analysis. The dependent variables studied are total investment and Mudharabh accounts and set of independent variables comprised of gross domestic product (GDP), unemployment rate (UER), income percapita (IPC) and consumer price index (CPI). The main objectives are to identify the relationship between the independent variables and to examine their influence on total deposits of investment and Mudharabah accounts. The results of Correlation showed that there is no relationship between all independent variables. The findings also proved that UER, GDP, IPC and CPI have significant relationships with investment and Mudharabah accounts. Finally, this study confirmed that UER is the most dominant factor that influenced both investment and Mudharabah accounts.

Keywords: Investment accounts, Mudharabah accounts, Economic factors, Maybank

1. Introduction

Over the years, many studies have been carried out to determine profitability of conventional banks. The literature divides bank profitability to internal and external measure. Meanwhile there are rarely studies pertaining to Islamic banks as compared to conventional banks. One of the earliest studies was done by Zakariya Man (1988). He compared the performance of BIMB with the conventional banks using ratios that represent capital structure, assets and deposits structure, and profitability. He found that the progress made by BIMB was encouraging and the experiences were somewhat similar to those of Islamic banks in other countries. The performance studies were also performed by Azzah Mahidin (1991) and Muhammad Anwar (1991). Both evaluated the performance of BIMB over a period of five years (1985; 1986-1990) in terms of growth of assets, shareholders' fund, profits, deposits and financing. Their studies found that BIMB had attained viability and growth, and its performance was excellent. Next many researchers moved to comparative studies between BIMB and the conventional banks. Dirar (1996) for example in his study compared the performance of BIMB with Maybank Berhad and BSN Commercial. In the study, he compared four factors which are growth, profitability, liquidity and capital adequacy ratios of the three selected banks. He found that BIMB's major financing was concentrated on trade-based investment compared to other two banks. In addition to that Saiful Azhar Rosly and Mohd Afandi Abu Bakar (2003) studied the performance of Islamic and mainstream banks in Malaysia. The results of their study showed that Islamic Banking Scheme (IBS) banks had recorded higher return on assets (ROA). In another research, Abdus Samad (1999) had studied the relative efficiency of BIMB and conventional banks of Malaysia during 1992-1996. The study examined productive and managerial efficiency in the sources and the uses of bank's funds. The weighted ratio approach was adopted in measuring various types of efficiencies of the banks. The measure of managerial test indicated that the managerial efficiency of the conventional banks was higher than that of the BIMB. All the profitability indexes indicated that profits earned by the BIMB were lower than the conventional banks. This meant that the Islamic bank had weaker efficiency compared to the conventional banks. The results were supported with ANOVA test. Unfortunately there is no study done on the performance of selected products of Islamic banking in Malaysia. Topics on the performance of total financing, deposits or investments in Islamic banks or Islamic windows are almost uncovered by the researchers. Lack of studies done on total deposits of investment accounts and Mudharabah

accounts in Islamic banking system has motivated the researcher to study that performance in relation to several economic factors in Malaysia. For the purpose of this study, Malayan Banking Berhad (Maybank) is chosen as the case of study. The objectives of this study are to examine the relationship between CPI with IPC, UER and GDP and to study the influence of those factors on total deposits of investment accounts and Mudharabah accounts in Maybank. There are three hypotheses to be investigated. First, there is no significant relationship between CPI with IPC, UER and GDP. Second, CPI, IPC, UER and GDP will not significantly explain the variance in total deposit of investment accounts in Maybank. CPI, IPC, UER and GDP will not significantly explain the variance in total deposit of Mudharabah accounts in Maybank.

2. Methodology

2.1 Research design

The purpose of this study is to examine and compare the relationship of total investment accounts and Mudharabah accounts in Maybank with the economic factors. The economic factors selected for analysis are CPI, IPC, UER and GDP.

2.2 Data analysis

The data used in this study are secondary data, which are taken from various income statements and balance sheets from annual reports of Maybank and reports of Central Bank of Malaysia from 1996 until 2007. The Statistical Package for Social Sciences (SPSS) Version 15.0 is used to analyze the data. Statistical testing such as Correlation and Multiple Regression are applied in the analysis in order to test the hypotheses developed for the research.

3. Results

Pearson Correlation is used to show the relationship CPI rate with IPC, UER and GDP. Next the study applied Multiple Regression analysis to analyze the influence of CPI, IPC, UER and GDP on designated dependent variable i.e total deposits of investment accounts and Mudharabah accounts. The results of this analysis are shown by the ANOVA, F-test, t-test and the correlation tables.

3.1 Correlation analysis

This analysis is to look the relationship among the set of independent variables i.e UER with IPC, CPI and GDP. Table 1 shows UER has a negative relationship with GDP, CPI and PCI. The entire variable is at low correlation. The conclusion is rejecting alternative hypothesis. Thus the result is there is no significant relationship between CPI with IPC, UER and GDP.

3.2 Multiple Regression analysis

The analysis is done separately for the total deposits of investment accounts and Mudharabah accounts. The results are shown in the tables of model summary, ANOVA and coefficients.

3.2.1 Total deposits of Investment Accounts

The result of R Square is shown in Table 2. It shows the value of R Square for investment accounts is 0.781 (78.1%). It means that UER, IPC, CPI and GDP explain 78.1 percent of the variance in total deposits of investment accounts. Thus the result shows that the model of regression is fit. The balance of 21.9 percent of the variance is explained by other variables which are not included in this study.

The following Table 3 shows the tests of the overall significance of the model (ANOVA) for the regression equation. Based on the significance level of 5 percent, the value of F-test in is $F(4, 7) = 6.224$, $p < 0.018$. Since the significance of the F value is below 0.05 ($0.018 < 0.05$), it is concluded that the overall model is significant. Thus, CPI, IPC, UER and GDP significantly explain the variance in total deposits of investment accounts in Maybank.

Table 4 presents the results of coefficients. Thus the Regression model of equation for this study is written as follows:

$$\mathbf{TDI = C + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \varepsilon}$$

TDI = -182,923,608.389 + 251,027,580.437 IPC + 771,229,614.548 CPI + 5835291958.125 UER + 137390060.211 GDP

The amounts of Beta under the Standardized Coefficients show that UER is the highest Beta, which is 1.118, compared to the other variables. It means UER is the strongest unique factor to explain the variance in total deposits of investment accounts. Meanwhile GDP has the lowest value for Beta which is only .317. Thus it means that GDP contributes less in explaining the variance in total deposits of investment accounts offered by Maybank. The results also present that there is positive relationship between all independent variables (UER, IPC, CPI and GDP) with the investment accounts. It means that when an independent variable increases one percent the total deposit will also increase. In this case when UER increases one percent total deposits will be increased by 58352919.581. Same with IPC, when it increases one percent total deposits will be increased by 2510275.804. For CPI, if CPI increases one percent total deposits increased

by 7712296.145 and last when GDP increases by one percent, total deposits increased by 1373900.602. On top of that only UER shows the significant result.

3.2.2 Total deposits of Mudharabah accounts

The value of R Square for Mudharabah accounts is 0.892 (Table 5). This means that UER, IPC, CPI and GDP explain 89.2 percent of the variance in total deposits of Mudharabah accounts in Maybank. The bigger value signifies that the model of equation is fit. While, the balance 10.8 percent of the variance are remain unexplained by the selected variables.

Table 6 shows the tests of the overall significance of the model for the regression equation. The value of F-test in this study is $F(4, 7) = 14.440$, $p < 0.002$. Here, the significance of the F value is below 0.05 ($0.002 < 0.05$), so it is concluded the overall that the model is significant. Since this is the smallest value, at which we can reject the hypothesis. Thus the CPI, IPC, UER and GDP significantly explain the variance in total deposits of Mudharabah accounts in Maybank.

The results of coefficients for Mudharabah accounts are shown in Table 7. Therefore the Regression model of equation is written as follows: $\mathbf{TDM = C + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \varepsilon}$

TDM = -15517352.659 + 282794.396 IPC + (84323.327 CPI) + 5254818.988 UER + 13452.835 GDP

The amount of Beta under the Standardized Coefficients shows that UER is the highest Beta, which is .918. It means that UER is the independent variable which contributes most to the total deposits of Mudharabah accounts. Meanwhile the variable that gives less support to the dependent variable is GDP which is only .029. The results also demonstrate a positive relationship between UER, GDP and IPC with total deposits of Mudharabah accounts. Only CPI has a negative relationship. It means that when CPI increases by one percent, total deposits for Mudharabah accounts will reduce by 84323.327. From the result it shows that only two independent variables are significance i.e UER and IPC. While other show insignificance relationships.

4. Conclusions

The general conclusions derived from this study are, first the results of Correlation showed that there is no significant relationship between CPI with IPC, UER and GDP. Second, the findings proved that UER, GDP, IPC and CPI have significant relationships with total deposits of investment accounts and Mudharabah accounts. Finally, this study confirmed that UER is the most dominant factor that influences both total deposits of investment and Mudharabah accounts in Maybank.

This study concentrates only on total deposits of investment accounts and Mudharabah accounts as the dependent variables. While only four economic factors i.e UER, GDP, IPC and CPI are selected as independent variables. So, it is recommended for future researchers to include other factors such as employment rate, base lending rate and others in their researches. Furthermore, the findings can be generalized if the sample size is increased to include other banks such as CIMB, RHB, BIMB and other Islamic banking institutions in Malaysia.

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Table 1. Correlations

		UER	GDP	CPI	PCI
UER	Pearson Correlation	1	-.309	-.372	-.301
	Sig. (2-tailed)	.	.329	.234	.342
	N	12	12	12	12

Table 2. Model Summary - Total Deposist of Investment Accounts

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.883(a)	.781	.655	11580553.4

a. Predictors: (Constant), GDP, UER, PCI, CPI

b. Dependent Variable: Investment

Table 3. ANOVA - Total Deposits for Investment Accounts

Model		df	F	Sig.
1	Regression	4	6.224	.018(a)
	Residual	7		
	Total	11		

Table 4. Coefficients - Total Deposits of Investment Accounts

Model		Unstandardized Coefficients	Standardized Coefficients	t	Sig.
		B	Beta		
1	(Constant)	-182923608.389		-3.463	.011
	UER	58352919.581	1.118	4.657	.002
	IPC	2510275.804	.460	2.010	.084
	CPI	7712296.145	.473	1.849	.107
	GDP	1373900.602	.317	1.159	.285

Table 5. Model Summary - Total Deposit of Mudharabah Accounts

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.944(a)	.892	.830	872225.937

a. Predictors: (Constant), GDP, UER, PCI, CPI

b. Dependent Variable: Mudharabah

Table 6. ANOVA - Total Deposits for Mudharabah Accounts

Model		df	F	Sig.
1	Regression	4	14.440	.002(a)
	Residual	7		
	Total	11		

Table 7. Coefficients - Total Deposits of Mudharabah Accounts

Model		Unstandardized Coefficients	Standardized Coefficients	T	Sig.
		B	Beta		
1	(Constant)	-15517352.659		-3.900	.006
	UER	5254818.988	.938	5.568	.001
	GDP	13452.835	.029	.151	.885
	CPI	-84323.327	-.048	-.268	.796
	IPC	282794.396	.483	3.007	.020

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Impact of Merger on Efficiency and Productivity in Malaysian Commercial Banks

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Abstract

This study seeks to determine the impact of mergers on efficiency and productivity of commercial banks in Malaysia for the period from 1995 until 2005. The study uses a non-parametric approach, namely DEA, to estimate the efficiency scores and to construct the Malmquist productivity index. To enable this estimation, three bank inputs and outputs were used. Amongst the findings are that banks exhibit higher efficiency scores after the merger and that the foreign banks are more efficient than the local banks. For productivity, the banks had improved in both periods, before and after the merger. However, it is the local banks that improved the most after the merger. The main source of productivity was technical change or innovation. The findings support the existing policy of having larger domestic banks in terms of size.

Keywords: Efficiency, Productivity, Data envelopment analysis, Commercial banks.

1. Introduction

By the end of the 1970s, Bank Negara Malaysia believed that there were too many banks in the country compared to its real size. The creation of new banks was not allowed and the existing banks were encouraged to consolidate. However, the call for bank consolidation throughout the 80s was not received well by the bankers. Only a few consolidations took place after the economic decline in 1985-86. After the Asian financial crisis, the government announced a major consolidation in 1999 that would reduce the number of domestic banking institutions to ten banking groups by 2000. Through this merger program, each domestic bank must have a minimum shareholder equity of RM2 billion and an asset base of RM25 billion (Bank Negara Malaysia, 1999).This consolidation exercise was finally completed in 2001.

This study wants to measure and compare the technical efficiency of the commercial banks before and after the merger and to identify the sources of productivity growth of the commercial banks. This is done by using a non-parametric approach, namely, data envelopment analysis. Original ideas of efficiency were discussed by Farrel (1957) and were later developed by the works of Aigner et al. (1977) and Meeusen and van den Broeck (1977) using a parametric approach and by the work of Charnes et al. (1978) using a non-parametric approach. On the other hand, the measurement of productivity using data envelopment analysis was introduced by Färe et al. (1994).

The findings of the study suggest that on average the commercial banks have improved in term of their technical efficiency. The scores of technical efficiency are higher after the merger. The study also indicates that the foreign banks are more efficient than the local banks. In term of productivity, the banks have improved by 9% in both period. This has been contributed by improvement in technology.

The current literature shows that there are three debatable issues related to the efficiency and productivity of financial institutions. The three issues are bank inputs and outputs, the concept of efficiency and productivity and the measurement of efficiency and productivity. A thorough discussion was provided by Berger and Humphrey (1997) and Ahmad Mokhtar et al (2006). Meanwhile, Siems and Barr (1998) and Chu and Lim (1998) showed differences in employing bank inputs and outputs. In the case of Malaysia, several studies looked into this topic, such as Katib and Matthews (1999), Ismail (2005), Sufian (2004, 2006), Sufian and Abdul Majid (2005), and Munisiamy and Pritam Singh (2008). Most studies focused on the developed countries.

The concept of productivity was introduced by Malmquist (1953). His work was later developed by Caves et al. (1982) and Grosskopf (2003). However, it was Färe et al. (1994) who initially developed the Malmquist Productivity Index using a DEA approach based on constant returns to scale. They analysed productivity growth in 17 OECD countries for the period 1979-1988. The decomposition of productivity growth was done under the assumption of constant returns to scale. They further stated that this decomposition provides an alternative way of testing for convergence of productivity growth, as well as allowing identification of innovations. Other studies on the productivity of financial institutions include Canhoto and Dermine (2003) and Casu et al. (2003). In the case of commercial banks in Malaysia, there were studies like Krishnasamy et al (2003), Sufian (2007) and Sufian and Haron (2008).

This study is organized as follows. Section 2 presents the methods and relevant models used in this study. This is followed with empirical results. Section 4 concludes.

2. Method

2.1 Efficiency model

This study uses the non-parametric approach, or DEA, due to its simplicity and for comparative purposes. This study follows the approach taken by Ismail (2005). He measured the efficiency scores and the productivity index of the commercial banks before the merger. However, this study extends his work by exploring the performance of the banks after the merger. He used the basic models of the DEA, the ones developed by Charnes, Cooper and Rhodes (1978), known as the CCR model and Banker, Cooper and Rhodes (1984), known as the BCR model. These models differ in terms of the basic assumptions made with regard to the returns to scale. This study uses the BCR model. Its primary formulation is written as

$$\text{Maximise } E_o = \sum_{i=1}^{s} u_i y_{io} - c_o \qquad \text{Equation 1}$$

subject to

$$\sum_{j=1}^{r} v_j x_{jo} = 1$$

$$\sum_{i=1}^{s} u_i y_{im} - \sum_{j=1}^{r} v_j x_{jm} - c_o < 0, \; m=1,.....,N.$$

where

E_o= relative efficiency of the bank *o*

s = number of outputs produced by the bank *o*

r = number of inputs employed by the bank *o*

y_i = the *i*th output produced by the bank *o*

x_j = the *j*th input employed by the bank *o*

u_i = s x 1 vector of output weights and

v_j = r x 1 vector of input weights.

i runs from 1 to *s* and *j* runs from 1 to *r*.

$u_i, v_j > 0$; (small but positive). The parameter c_o is unconstrained in sign. It indicates the various possibilities of returns to scale. $C_o > 0$ indicates increasing returns to scale and $c_o = 0$ implies constant returns to scale. Finally, $c_o < 0$ implies decreasing returns to scale. This model forms a convex hull of intersecting planes that envelop the data points more tightly than the CRS model. Therefore, it enables technical efficiency scores to be greater than or equal to those obtained under the CRS model.

2.2 Productivity model

To measure the productivity of commercial banks before and after the merger, this study follows the works of Caves et al. (1982) and Zhu (2003). These studies employed the technology within the period *t+1* as the reference technology (see Equation 2 below). Alternatively, the technology within the period *t* (base period) can also be used as the reference technology. This approach is taken by Casu et al. (2003), Canhoto and Dermine (2003), and Färe et al. (1994). The difference in the reference technology used affects the magnitude in interpreting the index. When the reference technology is based on period *t+1*, then $M_o > 1$ implies deterioration in productivity over the period under study. On the other hand, when the reference technology is based on period *t*, then $M_o > 1$ implies an improvement in productivity.

Our empirical Malmquist Productivity Index (M_o) is written as:

$$M_o = \frac{D_o^t(x_o^t, y_o^o)}{D_o^{t+1}(x_o^{t+1}, y_o^{t+1})} \left[\frac{D_o^{t+1}(x_o^{t+1}, y_o^{t+1})}{D_o^t(x_o^{t+1}, y_o^{t+1})} * \frac{D_o^{t+1}(x_o^t, y_o^t)}{D_o^t(x_o^t, y_o^t)} \right] 1/2 \qquad \text{Equation 2}$$

or

$$M = E * T$$

where

$$E = \frac{D_o^t(x_o^t, y_o^o)}{D_o^{t+1}(x_o^{t+1}, y_o^{t+1})}$$

$$T = \left[\frac{D_o^{t+1}(x_o^{t+1}, y_o^{t+1})}{D_o^t(x_o^{t+1}, y_o^{t+1})} * \frac{D_o^{t+1}(x_o^t, y_o^t)}{D_o^t(x_o^t, y_o^t)} \right] 1/2$$

where

M = the Malmquist productivity index

E = a change in efficiency over the period t and t+1 (the term outside the square bracket)

T = a measure of technical progress measured by shifts in the frontier over the period t and t=1 (the two ratios in the square bracket).

3. Results

To estimate the efficiency score, we used three inputs and three outputs. The process of estimating the individual efficiency of the commercial bank was carried out by using Excel Solver Software developed by Zhu (2003). For the construction of the Malmquist Productivity Index, the estimation was done under the assumption of constant returns to scale. The bank inputs and outputs are the same.

3.1 Descriptive statistics of the data

This study focuses on the conventional commercial banks only. Islamic commercial banks were excluded because of the different nature of the output produced. In principle, the outputs of Islamic banks are interest free. In 1995 and 1996, there were 37 commercial banks in Malaysia but only 32 banks were included in the sample. This is due to data limitations. Out of 32 banks, 21 were local banks and 11 foreign banks. Until 2000, the number of foreign banks in the sample remained at 11. The number of local banks started to fall in 1997 due to merger activity. The number was 31 in 1997, 30 in 1998, 28 in 1999 and only 9 in 2000. In 2000, data for some domestic banks were not available since the banks were about to merge. After 2000, the total number of commercial banks excluding Islamic banks stood at 23, 10 local banks and 13 foreign banks. The number of local banks was further reduced to 9 when another two banks merged in 2006. The inputs used were labour, total deposit and fixed assets. The outputs were total loans, other earning assets and other operating incomes. The descriptive statistics of the data is shown in Table 1.

3.2 Pure technical efficiency

Table 2 shows the efficiency score of commercial banks for each year for the period 1995 until 2005. On average, the efficiency scores before the merger were lower than the efficiency scores after the merger. For the period 1995 to 2000, the average score was 67.57% compared with 95.20% for the period 2001-2005. We applied a t-test to show that the mean difference between these two periods is significant. Our post-merger result is similar to the one found by Sufian and Abdul Majid (2005) and Sufian (2004).

3.3 Efficiency and bank ownership

We proceeded further by comparing the performance of both domestic and foreign banks. This comparison is shown in Table 3. The results clearly show that the foreign banks were more efficient than the local banks. The efficiency scores for foreign banks were 0.9003 compared with 0.6914 for the domestic banks.

3.4 Productivity and its sources

Using the same inputs and outputs, the Malmquist Productivity Index was constructed. Table 4 shows the Malmquist Productivity Index and the sources of productivity growth: efficiency change and technical change or the 'catching-up effect' and the 'shifting-up effect'. The table reports the changes in productivity during two consecutive years (taking

the second year to construct the benchmark technology or reference technology) as well as changes between 1995 and 2000 and between 2001 and 2005. Recall that the Malmquist Productivity Index (M_o) measures the change in productivity between two periods. Since technology in the second period is used as the reference technology, then if M_o is less than 1, there is productivity growth. If M_o is greater than 1, productivity deteriorates and if equal to one, productivity remains unchanged.

On average, productivity had increased over the 1995-2000 and 2001-2005 periods for the banks in our sample. In both periods, productivity increased by 9%. The productivity indexes stand at 0.91. This finding is slightly higher than those found by Krishnasamy et al (2003). They found that the productivity of the Malaysian commercial banks grew at 5% for the period 2001-2002. The main source of productivity growth came from technical change or innovation. The index for technical change was 0.98 before the merger and 0.78 after the merger. This implies that the frontier had shifted outward by only 2% before the merger and 22% after the merger.

3.5Productivity and bank ownership

We now turn to the comparison of productivity growth over two groups of banks. Table 5 shows the Malmquist Productivity Index and the sources of productivity growth for these two groups. For the period 1995-2000, both domestic and foreign banks experienced an increase in productivity (8% and 10%, respectively). The sources of the productivity growth originate from both efficiency and technical change. For domestic banks, efficiency change improved by 10% but technical change deteriorated by 13%. On the other hand, the foreign banks experienced 15% improvement in technical change whilst efficiency change became lower by 12 %. It should be noted that the estimation of this productivity index is done under the assumption of constant returns to scale.

After the merger, the productivity of domestic banks had increased by 34 % while the productivity of foreign banks deteriorated by 23%. The improved productivity of domestic banks was contributed to by technical change (35%) rather than efficiency change. For foreign banks, the deterioration in productivity was caused by the decline in efficiency (31%) although their technical change had improved by 9%.

4. Conclusion

This study shows that on average that the commercial banks had improved in terms of their technical efficiency. The scores were 67.57 % before the merger and 95.20 % after the merger. The difference in the scores has been proven to be statistically significant. Secondly, the foreign banks have higher efficiency scores than the local banks (90.03% compared with 69.14 %). Thirdly, the productivity of all banks increases by 9% in both periods (before and after the merger). This is contributed by improvement in technology (technical change) rather than efficiency change. An interesting finding is that the local banks have improved their productivity greater than the foreign banks'. However, it should be noted that the Productivity Index was constructed under the assumption of constant returns to scale.

The study found some justifications for the merger policy introduced by the Government in the late 1990s and also some support for the implementation of the Financial Master Plan (2001-2010). It can be stated that the merger had created more spaces for the banks to better utilize the resources and enhance their capacity, in particular the local banks. It had been claimed that before the merger Malaysia had many small banks relative to her economy. As a result of the merger, the local banks have been restructured. Bank branches were relocated so that any potential markets were well-captured.

The superior performance of the foreign banks should raise the eyes of the policy makers. The findings in this study are consistent with other studies that foreign banks are better in terms of utilizing their resources and producing outputs. The local banks should review their current practices and do benchmarking. It is already known that the local banks need to meet certain requirements set by the authorities. This is due to the needs to perform social obligations within the private sector. For example, priority areas have been identified for loan disbursement. The foreign banks, unlike this, are not required to meet this requirement. However, such requirements should not be taken as an excuse for their relative poor performance compared to their foreign counterparts. Service quality must be improved and the red tape in meeting customers must be removed. Professional attitudes must be upheld when entertaining customer needs.

The policy of enhancing the capacity of the banks should continue. By increasing the capacity, the banks can operate on a larger scale. Economic theory states that large scale operation enables lower costs and this can boost a bank's competitive edge. Easy access to banking services via the latest techniques, like online transactions, should be pursued further. By reducing face-to-face communication, transactions can be further improved. This can eventually place the banks on a higher frontier and higher efficiency levels.

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Table 1. Descriptive Statistics of Bank Inputs and Outputs (1995 – 2005)

	LAB	TD	FA	LOANS	OEA	OOY
1995-2000						
Mean	1922.17	7746.24	114.33	6946.64	4285.08	100.03
Std Deviation	2444.40	9998.41	157.61	9280.18	5945.13	135.94
Minimum	70.00	131.40	1.70	146.30	100.30	-4.60
Maximum	12200.00	60260.40	792.20	61003.90	32091.00	800.70
2001-2005						
Mean	3513.93	22992.04	300.95	18250.84	11102.83	460.97
Std Deviation	4001.61	25815.15	591.34	20442.63	12085.89	1424.83
Minimum	45.00	515.90	1.50	84.10	139.40	0.00
Maximum	19773.00	138149.90	4769.00	115481.60	59216.10	13917.00

Notes: a. LAB is the number of bank employees. TD is total deposits. FA is total fixed assets. LOANS are total loans issued by the banks (overdraft, term loans and others). OEA is other earning asset and OOY is other operating income. n is the number of commercial banks.

b. LAB figures for 1995, 1997 and 1999 are replacement value. The method used is mean substitution for each of the bank involved as suggested by Hair et al. (1998).

c. Figures are in thousands of ringgit Malaysia (RM) except for the number of bank employees.

Sources: Associations of Bankers in Malaysia (1996, 1998 and 2000).

Table 2. Summary of efficiency scores (1995 – 2005)

Pure technical efficiency	1995-2000 (%)	2001-2005 (%)
Mean	67.57*	95.20*
Standard Deviation	23.38	8.96
Minimum	23.14	68.18
Maximum	100	100

Note: * significant at 1% level.

Table 3. Efficiency scores and bank ownership (1995 – 2005)

Efficiency	Domestic banks[a]	Foreign banks	t-statistics	Significance level
Mean pure technical efficiency	0.6914	0.9003	-8.1690	0.0000
Standard deviation	0.2497	0.1415		
No. of observations	160	118		

Note: [a] Local banks consist of both private banks and state-owned banks.

* significant at 1% level.

** significant at 5% level.

Table 4. Malmquist Productivity Index and sources of productivity growth

Periods	Average Productivity Index (M_o) [a, b]	Efficiency Change	Technical Change
Before merger: 1995/2000	0.91	1.02	0.98
After merger: 2001/2005	0.91	1.16	0.78

Note: a. The calculation of productivity index is done based on the assumption of constant returns to scale and under input orientation.

b. $M > 1$ means deterioration in productivity, $M=1$ means no change in productivity and $M < 1$ means improvement in productivity.

Table 5. Malmquist Productivity Index and sources of productivity growth by type of bank

Banks	1995-2000	2001-05
Productivity index [a, b]		
Domestic banks	0.92	0.66
Foreign banks	0.90	1.23
Efficiency Change		
Domestic banks	0.90	1.01
Foreign banks	1.12	1.31
Technical change		
Domestic banks	1.13	0.65
Foreign banks	0.85	0.91

Note: a. The calculation of productivity index is done based on the assumption of constant returns to scale and under input orientation.

b. M > 1 means deterioration in productivity, M=1 means no change in productivity and M < 1 means improvement in productivity.

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The Relationship between Energy Consumption Growths and Economic Growth in China

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Abstract

Energy plays an important role in the economic development. Hence many studies have attempted to test for causality between energy and economic growth. This paper investigates the causal relationship between energy consumption and economic growth in China. By applying techniques of ADF, co-integration, Hsiao's Granger causality, the paper analyzes this relationship, and the results infer that economic growth granger causes energy consumption and energy consumption granger causes economic growth respectively.

Keywords: Causality, Energy, GDP, Co-integration, Hsiao's Causality Tests

1. Introduction

Energy plays an essential role in an economy, so the relationship between energy consumption and economic growth is now well researched in the literature. Lots of literatures are based on the questions that whether economic growth leads to energy consumption or that energy consumption is the engine of economic growth. The answer to this question has important implication for the policy makers. Empirically it has been tried to find the direction of causality between energy consumption and economic activities for some countries employing the Granger Test, ECM and other techniques. The result show the answer is mixed.

In the recent papers, Morimoto & Hope (2004) analyzed the relations between electricity and GDP growth in Sri Lanka from 1960 to 1998 by using Granger Test. Ghali and El-Sakka (2004) found that the short-run dynamics of variables indicated that Granger's causality is running in two directions between output growth and energy consumption based on data from Canada. Ghosh (2002) found no co-integration and argued that there is unidirectional Granger causality from economic growth to electricity consumption using annual data covering the time span 1950–1997 in India. Oh and Lee (2004) found causal relationship between energy consumption and economic growth respectively in Korea from 1970 to 1999 using year data by co-integration & ECM. Paul & Bhattacharya (2004) investigated the causality between energy consumption and economic growth for India, found different result by using different method. Altinay and Karagol (2005) found that electricity-GDP causality in Turkey from 1950 to 2000 by the method of Doladoand and Granger. Lee (2005) investigated the causality between energy consumption and economic growth for 18 developing countries by using Panel Co-integration and ECM, finding energy-GDP causality exist from 1975 to 2001. Jaruwan Chontanawat (2006) reviewed the papers and listed the mainly research on the relation between energy consumption and economic growth by table from 1985 to 2005. In these papers, only two ones directly associated with China.

A similar study would be beneficial in China to design an economic policy framework for the energy. The paper tries to research on this question. The reminder paper is organized as follows. Section 2 presents the method used in this paper. Section 3 presents the data and discusses the results of the co-integration analysis. **The final section summaries and concludes.**

2. Methodology

From the literature we can find that there are mainly four methods in this area, including ECM, Ganger, Co-integration and Hsiao's Granger. Each has its **advantage and shortcoming.** However in four methods, the Hsiao's Granger is later, which enhances Granger-causality by using the Akaike (1969) Final Prediction Error (FPE) criteria to decide lag length, and widely used recently. Given the hypothesis of econometric and the limitation of four methods, lots of literatures adopt three stage methods. This paper also adopts this method.

This method includes the following three stages:

Stage 1: Testing the stationary of the variables using the Augmented Dickey-Fuller (ADF) test. From this we can find whether the variable is I(0) or I(1), or others. If variable is not I(1), then goes to stage 3a directly, or else goes to stage 2.

Stage 2: Testing for co-integration between variables using the Johansen (or others) technique. If co-integration is found, then proceed to Stage 3b, or else go to stage 3a.

Stage 3a: Testing for causality from variable A to variable B (and variable B to variable A) using the Hsiao's Granger.

Stage 3b: Using 'Hsiao' on 'ECM' to test long run relation. If the estimated coefficient of the EC term is positive, then causality is re-estimated with different terms as shown in Stage 3a.

The three stages' methodologies include four methods, including ADF, Johansen test, Hsiao's Granger test and 'Hsiao' on 'ECM'.

(1) ADF

Here take y_t as example, ADF test based on H0: y_t is not I(0) which is given by the following equation(1). If the calculated ADF statistics are less than their critical values from Fuller's table, then the null hypothesis (H_0) is rejected and the series are stationary or integrated or I(1).

$$\Delta y_t = a + by_{t-1} + \sum_{i=1}^{\gamma} c\Delta y_{t-i} + \varepsilon_t$$

Where Δ is the difference operator, $a, b, c,$ are parameters to be estimated, ε_t is white noise, γ is selected.

(2) Johansen test

Johansen test has two test means. One is trace test and the other is max Eigen-value test.

(3) Hsiao's Granger test and 'Hsiao' on 'ECM'

Hsiao's Granger is based on Granger; the results of Granger causality are very sensitive to the selection of lag length. To deal with this problem, Hsiao (1981) has developed a systematic autoregressive method for choosing optimal lag length for each variable in an equation. This method combines Granger causality and Akaike's Final Prediction Error (FPE).

The standard Granger (1969) test states that, if past values of a variable Y significantly contribute to forecast the value of another variable X_{t+1} then Y is said to Granger cause X and vice versa. The test is based on the following regressions.

$$y_t = \alpha_1 + \sum_{i=1}^{m} \beta_i y_{t-i} + \sum_{j=1}^{n} \lambda_j e_{t-j} + v_t \tag{1}$$

$$e_t = \alpha_2 + \sum_{i=1}^{m} \gamma_i e_{t-i} + \sum_{j=1}^{n} \delta_j y_{t-j} + \varepsilon_t \tag{2}$$

Where y_t and e_t are the variables to be tested,

$y_t = \ln(Y_t)$; $e_t = \ln(E_t)$; $Y_t =$ real GDP; $E_t =$ Energy consumption;. v_t and ε_t are mutually uncorrelated white noise errors; t denotes the time period, i and j are number of lags.

In equation(1), e causes y if the current value of y is predicted better by including the past values of e than by not doing so. The homologous explaining to equation (2). By according to Granger (1986), the test is valid if the variables are not co-integrated. Following the developments of co-integration, for non-stationary variables, if variable is integrated one, equations (1) and(2) should be written by first difference.

$$\Delta y_t = \alpha_1 + \sum_{i=1}^{m} \beta_i \Delta y_{t-i} + \sum_{j=1}^{n} \lambda_j \Delta e_{t-j} + v_t \tag{3}$$

$$\Delta e_t = \alpha_2 + \sum_{i=1}^{m} \gamma_i \mathrm{H} e_{t-i} + \sum_{j=1}^{n} \delta_j \Delta y_{t-j} + \varepsilon_t \tag{4}$$

The key of Hsiao's Granger is applying Akaike (1969) Final Prediction Error (FPE) criteria in granger test. Its main function is to confirm the lag length. The lag length is decided by the sample size and economic process. Generally, it is better to select m as large as possible. For example, to test whether e causes y, one-dimensional autoregressive process is first estimated as equation(5), the value of i is from 1 to m. Then we can compute the FPE for each equation (m changing), and compute the equation(6). The optimal lag length m^* is the lag length which produces the lowest FPE.

$$\Delta y_t = \alpha_1 + \sum_{i=1}^{m} \beta_i \Delta y_{t-i} + v_t \tag{5}$$

$$FPE(m) = \frac{T+m+1}{T-m-1} SSE(m)/T \tag{6}$$

Where T is sample size and SSE is sum of squared errors.

According to the above statement, Hsiao's procedure requires two steps. Also taking test whether e causes y as example.

The first step is according to equations (5) and(6), we can compute m^*.

The second step is that regressions are estimated with the lags on the other variable (n) added sequentially in the same manner used to determine m^*. According to equation (3) and m^*, we compute FPE for each regression as equation(7).

$$FPE(m+n) = \frac{T+m^*+n+1}{T-m^*-n-1} SSE(m+n)/T \tag{7}$$

If $FPE(m^*+n^*) < FPE(m^*)$ then e Granger causes y, whereas e does not Granger cause y.

The above part explains the Hsiao method based on no co-integration. If co-integration is found, then test whether *e* causes *y* and *y* causes *e* in this framework .the *EC* term is added, construct equations (8) and (9) is as follows:

$$\Delta y_t = \alpha_1 + \delta_1 EC_{t-1} + \sum_{i=1}^{m} \beta_i \Delta y_{t-i} + \sum_{j=1}^{n} \lambda_j \Delta e_{t-j} + v_t \tag{8}$$

$$\Delta e_t = \alpha_2 + \delta_2 EC_{t-1} + \sum_{i=1}^{m} \gamma_i \mathrm{H} e_{t-i} + \sum_{j=1}^{n} \delta_j \Delta y_{t-j} + \varepsilon_t \tag{9}$$

where EC is the error correction term from equation (3).

3. Empirical Results

(1) Data

The data includes GDP and energy consumption from 1953 to 2006. We can gather data from China statistics yearbook and the net of GDP is in hundred million RMB using the present price, consumption is in ten thousands tons criteria coal which calculated by equivalent to generate power. They can be gathered from the net of the National Bureau of Statistics and China Economic Information Network. The data list in table1.

Insert Table1 Here.

(2) Results

The results of our estimations are presented step by step. The result is computed by Eviews5.1.

Test for stationary

The results are reported in table.2. This is achieved when testing *e* and *y* in levels by including a constant term and a time trend in the ADF equation whereas when testing the first differences of *e* and *y,* the ADF equation includes a constant. For both, the number of lags is determined by using the Schwarz info criteria (SIC). This table shows that the series of GDP and energy consumption are stationary in the first difference, and integrated of order I(1).

Insert Table 2 Here

Test for co-integration

From above table, the variables which have been tested for the order of integration and found to have the same order are used to estimate co-integration regression. We adopt "intercept (no trend) in CE and test" and lag interval choose (1,1). Table 3 reports the results of the Johansen tests. The absolute values of the calculated test statistics for all the residuals are more than its critical value at the 5 percent level. Neither series is co-integrated.

InsertTable 3 Here

Hsiao's granger causality test

Because of no co-integrated the standard Granger test is appropriate, and then we should go to stage 3a. By following the estimations based on equations (3) to(7), we are able to reach the results of Hsiao's Granger test reported in tab.4.

Insert Table 4 Here

The results of Hsiao's causality tests indicate that economic growth causes energy consumption and energy consumption causes economic growth respectively by the GDP equation and the energy consumption equation, where two equations have the condition of $FPE(m^* + n^*) < FPE(m^*)$.

As for economic growth causes energy consumption, the economy development is supported by heavy industry and construction industry. Two industries both are high energy consumption industries. More serious is that the price of energy is low; the consciousness of saving energy is dim. So the development of economy is in the cost of energy consumption. So the economic growth causes energy consumption.

As for energy consumption causes economic growth, the energy is one of based industries. The consumption of energy is produced in domestic in China. Sensitive factor and influential factor of energy industry both are high, so the development of energy industry drives the growth of other industry, and then promotes economic growth.

4. Summary and Policy Implications

In this paper we try to investigate the casual relationship between growth in energy consumption and growth in GDP, especially discussing whether uni-directional or bi-directional causality exists between energy consumption and economic growth in China. From the data analysis, we find the logarithm of GDP and economic consumption are one integrated by ADF test. From Johansen co-integration test, co-integration is not found. Then according to Hsiao's granger causality test, we can inform that economic growth granger causes energy consumption and energy consumption granger causes economic growth.

The result has important policy implications. China is a big energy consumer agent, which has a huge gap between energy supply and demand. What is more serious is that Chinese energy efficiency is very low. So the economic growth needs more energy. The economic growth was supported by construction, steel, metallurgy, equipment electro-analysis aluminum, glass and etc, all of which are high consumer of energy. In a way, this is concerned with the economic development phase. But we should also change the increase mode of economy and consciousnesses of energy consume, pay attention to saving energy and enhancing energy efficiency from the whole energy chain. In detail we should do as hereinafter.

Firstly, to enhance the rate of taxes and the price of energy, bring up the consciousness of saving energy and improve the exploitation efficiency step by step. Secondly, bring price difference of electrovalence in practice, higher price to the industries which have high level of energy consumption; promote them to enhance the energy using efficiency. Thirdly, improve on manner of economic using, especially in living. Fourthly, pay attention to circulation use of energy.

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Table1. Data

Year	GDP	Energy	Year	GDP	Energy
1953	824.2	5411	1980	4545.6	60275
1954	859.4	6234	1981	4891.6	59447
1955	910.8	6968	1982	5323.4	62067
1956	1029	8800	1983	5962.7	66040
1957	1069.3	9644	1984	7208.1	70904
1958	1308.2	17599	1985	9016	76682
1959	1440.4	23926	1986	10275.2	80850
1960	1457.5	30188	1987	12058.6	86632
1961	1220.9	20390	1988	15042.8	92997
1962	1151.2	16540	1989	16992.3	96934
1963	1236.4	15567	1990	18667.8	98703
1964	1455.5	16637	1991	21781.5	103783
1965	1717.2	18901	1992	26923.5	109170
1966	1873.1	20269	1993	35333.9	115993
1967	1780.3	18328	1994	48197.9	122737
1968	1730.2	18405	1995	60793.7	131176
1969	1945.8	22730	1996	71176.6	138948
1970	2261.3	29291	1997	78973	137798
1971	2435.3	34496	1998	84402.3	132214
1972	2530.2	37273	1999	89677.1	133831
1973	2733.4	39109	2000	99214.6	138553
1974	2803.7	40144	2001	109655.2	143199
1975	3013.1	45425	2002	120332.7	151797
1976	2961.5	47831	2003	135822.8	174990

Table 2. Unit root tests

Variables	ADF Test			ADF Test			Result
	Level	P-value*	Lag	Difference	P-value	Lag	
lnGDP	-1.2910	0.8790	2	-4.0143	0.0028	1	I(1)
lnEnergy	-2.1706	0.4943	6	-4.1669	0.0018	1	I(1)
*MacKinnon (1996) one-sided p-values.							

Table 3. Co-integration tests

Hypothesis		Johansen Test statistics				Co-integration accepted?	Note
H0	H1	Trace	5%	Max-eig	5%		
r=0	r>0	10.7689	15.4947	10.6679	14.2646	No	Both tests indicate no co-integrating equation at 5%
r<=1	r>1	0.1010	3.8415	0.1010	3.8415		

Table 4. Results of Hsiao's causality tests

Item	F(m*)	m*	SSE(m*)	F(m*,n*)	N*	SSE(m*, n*)	Causality Result
The GDP Equation	0.1899	6	0.1448	0.1745	1	0.1280	$e \rightarrow y$
The energy consumption equation	0.3467	6	0.2644	0.3249	1	0.2383	$y \rightarrow e$

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Water Pricing, Affordability and Public Choice:

An Economic Assessment from a Large Indian Metropolis

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Abstract

The combined use of surface and groundwater that recognizes site-specificity and communities' preference structure can greatly determine the social and economic sustainability of communities in a growing metropolis. Utilizing both primary and secondary information pertaining to the water sector of India's capital city, this paper collectively looks at water demand, public choice and financial sustainability of water supply augmentations in both planned urban and unplanned peri-urban areas having differing levels of planning and resource availability. Households' preference heterogeneity for water supply scenarios differentiated by their 'quality' (potable or non-potable) and 'source' (surface or groundwater) has been examined through a carefully designed choice experiment (CE) using iterative bidding game. Household's choice and preference behaviour for dual quality water (decentralized municipal water for drinking and local groundwater for other purposes), single potable quality water and the 'business-as-usual' scenarios are assessed through utility function based multinomial logit (MNL) and nested logit (NL) choice models. The values resulting from the analysis are assessed in terms of water supply augmentation options and their practical limits incorporating the choice and preferences from the heterogeneous planning environments typical of a metropolis.

Keywords: Public choice, Water, Resource quality, Pricing, Willingness to pay

1. Introduction

When considering natural resource use in an economic sense, questions of both 'adequacy' and 'quality' levels available to the communities are of vital importance. Economics, the application of choice offers a means of understanding the nature of the choices people make and, through this understanding, researchers or policy makers decide upon a 'resource-conservative' approach that satisfies society's demands as well as improves resource sustainability (Kolstad, 2003). Adequate quantity of water meeting safety standards whether sourced from underground aquifer or streams has been increasingly viewed as an economic good fundamental to people's health, survival, growth and development (Note 1). Due to increasing demand from the society and the economy, water has become a scarce resource. The scarcity is deepening day-by-day due to limited availability and supply constraints. Additional quality deterioration further exacerbates water scarcity (Ahmad *et al.,* 2005). The scarcity scenario has undoubtedly changed people's perception and awareness about 'source limits' and economic realities of water supply made available by the government and public utilities. Many analysts argue that because water is increasingly scarce, it is increasingly valuable – and this value should be made evident by pricing water and allowing markets to establish the 'right' price for it. It has been observed by several researchers and development experts that both quality and quantity is compromised when it comes to providing water to communities in developing countries (Briscoe & Malik, 2006). The low level of social optimum resulting from services ensured by the public utility has led the urban and peri-urban communities to develop alternative strategies based on private groundwater augmentation. These alternative strategies might include direct use of groundwater from a private tubewell, development of a private small supply network fed with untreated groundwater, or supply by tanker, groundwater remaining the primary source of raw water in most of those private supply chains (Ramachandran, 2008; Maria, 2004; Llorente and Zérah, 2003; Saleth & Dinar, 2001).

This paper is structured as follows. First, we briefly set the context and describe the problem area both from the theoretical and empirical angle. Second, we explore the metropolis context and in particular, gather empirical evidence

from a survey to see how scarcity is perceived in urban and peri-urban settlements with congregating determinant factors influencing the alternate choice behaviour of communities. Our discussion focuses on the source and quality aspects, mostly by assuming that two main sources groundwater and surface water with differing quality attributes are consumed having differing 'scope' of benefits and reach of its externalities. Third, the values resulting from the analysis are assessed in terms of water supply options and their practical limits incorporating the choice and preferences from the heterogeneous planning environments. The paper argues that more attention must be paid to diverging perceptions of the quality and availability of a natural resource and of how it should be accessed and delivered to maintain both the resource sustainability and public acceptability.

2. Setting the context

Reliable supply of a natural resource such as water in the wake of rising per-capita demand, declining resources as well as deteriorating quality levels require substantial financial resources to attain desired dependability. When a public water system is unavailable, insufficient, unaffordable, or inoperative, households pump groundwater privately to meet their needs. Many households either partially or totally substitute groundwater for water purchased from private vendors and the public supply, depending on the cost of extraction and the quality of the water. Groundwater has been exploited more and more widely and its consumption has increased dramatically in India's Capital city and its peri-urban communities, which is representative of the situation of many regions in developing metropolises. The main reason behind this situation is lack of a reliable water supply, which comes largely from surface water sources. As a result, major domestic chunk depend on groundwater, and because local authorities have historically not controlled withdrawals, the aquifers have been overdrawn. In spite of the public neglect of groundwater as a resource for urban water supply, groundwater plays a central role in meeting urban needs through a variety of private and uncontrolled systems (Maria, 2004) (Note 2). The inherent distinctiveness of urban environments was neglected in water supply considerations by planners in the past. While the planned urban settlements incorporate water design principles to some extent, the peri-urban settlements present unique resources attributes as a result of differing socio-economic values, flow asymmetries, and joint production potential (Tovey, 1998).

In the study area, despite the existence of a piped water system at least 36% of the planned urban population meets 90% of its water need from personal tubewells. Reliance on groundwater becomes almost 100% in many cooperative society flats who resort to deep drilling to withdraw groundwater. They have their own water distribution systems that often provide 24×7 water supply. The residential societies and real estate developers have in the past joined in a cooperative effort to devise an alternate management plan to augment the availability and improve the quality depending less on the public water supplies. The additional water is sought from the local bore wells due to the fact that groundwater is a more dependable water source than the surface water supplied from the water utility. In the unplanned peri-urban areas, very high proportion of population is outside the piped network and in such areas groundwater forms the main source of water. According to the study, the demand-supply gap in planned colonies is nearly 20 % less than the gap in unplanned peri-urban colonies. The households dig shallow wells fitted with handpumps or install motors and draw subsoil water. Owing to this situation of escalating population without a commensurate increase in the availability of raw water, the groundwater in many blocks has been over exploited. This has disturbed the hydrological balance leading to decline in the productivity of wells, increasing pumping costs and more energy requirement. Utilisation of groundwater in peri-urban settlements is very common which means that people consider this resource as potentially important. However, the quantity of fresh water is very marginal and most of the groundwater reserves consist of brackish or saline water.

The Delhi Jal Board acts as an autonomous body under the Government of the National Capital Territory (NCT, 1483 sq.km), and is estimated to serve around 14 Million people. Although the DJB has a production capacity of around 2900 Millions Liters a Day (MLD), non revenue water assessed by various studies quote it as high as 59% (Note 3). Therefore, although the per capita availability according to the production capacity is over 200 lpcd, the DJB is currently unable to provide a level of service matching the demand of the population. Allocation of water among the users is performed through scheduled intermittent supply, which leads to significant wastage of water due to the habit of emptying storage tanks before every new round of supply, as well as quality problems due to sewage infiltration in distribution pipes. The proper functioning of the distribution system is further jeopardized by the common practice by individual users of installing suctions pumps in order to increase the amount obtained during the limited period of supply. Various supply augmentation schemes that rely upon interstate water transfer would eliminate the demand-supply gap by 2021; however, such approaches are costlier and would remain to be financially non-viable in the long run due to inefficient water use as well as possibility of serious inter-sectoral and inter-state water allocation conflicts. Such schemes may also damage the incentive environment. Much of the future demand would be satisfied if the water losses in raw water transmission and treated supply can be drastically reduced. The pressure can also be reduced by promotion of multiple water sources augmented locally both by private and public means including in-house water use efficiency and conservation.

2.1 Theoretical construct: Public choice, social optimum and conjunctive use of groundwater and surface water

In an environment of constrained resource availability, choice of water supply options and preferences vary according to several factors including planning levels, local perception of water scarcity, individual water use requirements, and previous experience with irregularity in supply (Hanley *et al.* 2001, 2005; Louviere *et al.* 2000; Ryan & Wordsworth, 2000; Adamowicz *et al.* 1994). Due to diverse socio-economic status and heterogeneous customers' preference structure, public choice and economic values in decision-making transform into a site-specific problem. The policy choices regarding water supply reliability affect large numbers of people, making some better off and others worse off to varying degrees. The policy maker wishes to prefer policies that produce the largest possible increases in social wellbeing or welfare. When decision makers choose from alternative policies, they identify the favorable (beneficial) and adverse (costly) consequences associated with each alternative and choose the preferred option (Amador *et al.* 2005; Chesher & Santos-Silva, 2002; Huttala 2000). That is, if one scenario dominates the rest in the choice occasion, then it has more of all 'good attributes' and less of all the 'bad attributes'. In large metropolis, the current water supply system typically falls well short of offering customer classes a product that is a precise fit to the segment's needs. Solution may be reasonably acceptable to people in planned areas but at the same time totally unacceptable to customers in unplanned areas or vice versa. Given the social, economic and environmental externalities associated with unsustainable water use, it is important that the customer's 'preferred choice' informs the investment in infrastructure restructuring. The cost of infrastructure restructuring is influenced by the decisions of the utility with regard to reliability, quality and extent of supply. All decisions cannot be made in isolation and interaction with the customers is necessary to reach the correct balance and allocation of costs and benefits (Koundouri *et al.,* 2003; Foster *et al.,* 1998; Davis & Whittington, 1997).

Assume that water supply without source distinction is expressed by one variable Q and the supply function S_p is inelastic with monotonically declining demand D (Figure 1). The alternative supply with local groundwater augmentation by the communities has monotonically increasing demand with the alternative supply function S_A. The current scenario of single quality supply at service level Q_p is provided at price P_p; however, the actual service level would be lower than Q_p because customers use multiple alternatives at local levels, leading to lower cost recovery for the centralised service provider. At P_p the quantity demanded is $Q_{p'}$ ($>Q_p$), but this quantity cannot be provided by single quality public supply using surface water due to reliability constraints. Consumer surplus at P_p is P_pBCd', which does not reach its potential level P_pBE and producer surplus at this point is $AP_pd'Q_p$. Social surplus at P_p is $ABCQ_p$. Customers desire better quality and reliability and hence are willing to pay up to P_1 to improve the service level. In the absence of improved services, alternative options will be considered by the communities. An alternative supply using both local groundwater and municipal supply water, characterized by a supply function S_A will produce equilibrium values of P_2 and Q_2. Consumer surplus at P_2 is P_2BF and producer surplus is P_2FH. Social surplus at P_2 is HBF. The alternative supply will therefore be socially justified if $HBF - ABCQ_p$ is greater than zero, or if $CFD > AHdQ_p$.

Furthermore, with two alternative supplies having different quality attributes, S_A and S'_A, both going through point F and characterized by price elasticities ES_A and ES'_A, it is observed that $ES'_A < ES_A \Rightarrow |CFd - AHdQ_p| < |CFd' - A'd'Q_p|$ Estimation of demand and supply elasticities make it possible to empirically calculate the areas under the demand and supply curves, and perform welfare comparisons. Let E_D be the price elasticity of demand, and E_{SP} and E_{SA} the price elasticities of single quality public and dual quality 'alternative' supply, respectively. Note that $E_{SP} >> E_{SA}$. Since all quantities are known, and if we assume that while changing supply arrangement quantities demanded will not change dramatically (or in other words, that the demand function remains intact), one can derive the equilibrium price and calculate areas under the supply and demand curves. Suppose that Q_p and Q_2 are observed at levels of q_P and q_2, respectively, with $q_2>q_P$. Then $\Delta q=q_2-q_P$. By using the price information in the same way, define $\Delta P=P_2-P_P$. Let the 'alternative' supply curve be $q_A= \alpha + \beta P$, where α is an intercept and $\beta = \Delta q/\Delta P$. Note that $E_{SA} = (\Delta q/q)/(\Delta P/P)=(\Delta q/\Delta P)(P/q)$. Since E_{SA}, P and q are known, $(\Delta q/\Delta P) = E_{SA}/(P/q)$. This can be inserted into the 'alternative' supply equation which becomes $q_A= \alpha + [E_{SA}/(P/q)]\, P$. A similar procedure can be used to specify public supply and the demand equation. Most groundwater aquifers are open access resources, and therefore these aquifers are characterized by divisibility and non-exclusivity. In other words, the amount of water extracted by one household affects the availability to others. As the height of the water table decreases, the additional unit cost of extraction for all

other households increases who share the same aquifer. Under these conditions, no household has an incentive to conserve or reduce extraction to sustainable levels unless all households cease over extraction through joint action. Given that the quantity extracted by a household is private information, other households will tend to over extract. This behavior would threaten resource sustainability and lead to irreparable ecological damage to the aquifer.

Markets for public water supply may be subject to imperfections due to large economies of scale resulting in high investment cost, resource sustainability, physical and legal constraints to reach to all customer classes, complex institutional structures, and preferential concern for different user groups having varying cultural values (Bakker, 2003). Therefore, good policymaking requires sound assessment and evaluation of impacts in monetary terms to facilitate decision makers design need-based policies for taking appropriate location specific actions (Bateman *et al.* 2002; McFadden 2001). This places a challenge on estimating change in the water service provisions specially water quality. In the study area, resource availability as well as consumption between planned urban settlements and unplanned peri-urban settlements is uneven varying distinctly with property class. Even though affluent planned colonies receive far larger and even share of water than the poorer unplanned peri-urban colonies, they demand more hours of supply than the existing duration. It is observed that with increasing planning class and discretionary income, households spend higher amount of money to avert water supply unreliability both from quality and quantity angle. A high proportion of customers in both planned urban and unplanned peri-urban areas use 'point of use' treatment options for potable requirements. The usage of water purifiers is very high in planned colonies mainly due to perceived private health benefits in the safety and aesthetic qualities of purified water compared to the municipal water. Even in unplanned areas, many customers have designed their own point of use or point of delivery method for using dual quality water with different sources.

In this background, it is necessary to ask questions and provide answers to following pertinent questions concerning a very important natural resource – water:

- if it is necessary to develop different distribution systems for potable and non-potable water end-uses having heterogeneous customers' preference structure (which has become a reality, but nevertheless neglected in planning process). Also required is an understanding of how an alternative policy instrument of quality based pricing can modify water use pattern among households across different socio-economic and planning classes,
- if decentralized approaches are viable solutions for newer colonies and peri-urban settlements,
- if the key to the problems is a 'market solution' or rather an 'administrative solution' and that the needed investments will be generated by the private capital.

3. Methodology

As there is no perfect market for supplying a natural resource, either a stated-preference function or household health production function has to be estimated to find the value households place on it for getting private health benefits (Bateman & Willis, 1999). Accordingly, the well reviewed method of choice experiments (CE) are employed on a multistage-stratified random sample of 1100 households spread over planned urban and unplanned peri-urban residential units categorized by 'property-tax-class'. Property-tax-class is taken for stratification to introduce first level of preference heterogeneity. Water supply source with different quality and quantity attributes induce the second level of heterogeneity in preference behaviour. Iterative bidding game is used as the elicitation technique to find out households' stated amount in terms of willingness to pay (WTP) as described in Gloria *et al.* (2005), Wedgwood & Sanson (2003) and Carson (1991). The dependent variable, households' choice of water supply scenario is observed as a discrete variable and multinomial logit (MNL) and multinomial nested logit (NL) models are used for estimating households' WTP in both planned urban and unplanned peri-urban residential units using statistical package LIMDEP 8.

3.1 Survey design, scenario definition and analysis of public choice

The design of the questionnaire is based on research papers in valuation studies and available guidelines such as Wedgwood & Sanson (2003), MacDonald & Young (2002), the World Bank's Living Standard Measurement Survey (LSMS) manual (Grosh & Glewwe, 2000), DLTR's guidelines on WTP survey, ADB training manual on water sector, IWWA's manual on water demand assessment for urban water supply projects (2002). The final questionnaire consisted of the four sections: (a) section on socio-economic characteristics (b) preliminary attitudinal section (c) a section on water supply situation and (d) choice experiment with valuation section. The choice question format followed split bidding game in both planned urban and unplanned peri-urban residential units. The first question asked about the respondent's willingness to support (vote for) a supply option, i.e. choice; the second question asked about how much they would actually pay per kilolitre of water as well as maximum monthly water bill for a particular preferred choice with different choice-sets.

There are basically 3 broad choice-sets with different quality, quantity and reliability attributes in the choice experiment:

(1) Dual quality river and local groundwater – 20 to 25% potable water (36 lpcd) meeting WHO or EU standards (e.g., 80/778/EEC standard) and 75 to 80% non-potable water (129 lpcd) meeting extended limits of IS 10500

(2) Single quality river water (165 lpcd) meeting IS 10500 quality standards with increased hours of supply

(3) Business-as-usual (Note 4)

(a) Those who are willing to pay for the existing supply if the current supply is maintained as per notified timing with additional private investment on water purifiers or bottled water for potable needs

(b) Those who are not willing to pay anything and demand no improvements in supply attributes (opt-out)

Everything is common between these two treatment groups – 3(a) and 3(b) except that those opting for 3(a) also reveal their willingness to pay for the current supply. And interestingly, their stated willingness to pay is higher than their water bills implying that either they are not aware of water rates being charged or they want to pay higher to maintain existing supply. The valuation questions actually pose complex choices and require careful consideration on the part of the respondent who knows better his level of utility. Therefore he is able to state his true preferences and willingness to pay attached to the current supply. Those opting for 3(b) have zero wiliness to pay (or sometimes negative WTP).

Prior to designing the survey, a series of exploratory, qualitative group discussions were conducted with members of the research committee and small group of households to identify the salient aspects of the water services. 'Focus groups' were used which were assembled to discuss their reactions to the hypothetical market, following the pre-test prior to conducting the main survey. The focus group was comprised of researchers, statisticians, students and local representatives agreed on a sample size of around 100 to properly reflect the distribution of households in different income brackets and geographic locations. Four focus groups were conducted with residential customers and survey enumerators, each exploring customer's perceptions and experiences of water services. The information that was obtained during the focus groups was utilized to design the experiments, including which service attributes were included in the experiments, how the attributes were described, and the levels that each attribute could take. A total of 1100 interviews were completed spread over planned and unplanned settlements. Few of them were rejected due to non-response and missing data.

3.2 Modeling preference behaviour using discrete choice data

Preferences for change versus *status quo* and customer's willingness to pay are estimated through utility function based discrete choice multinomial logit and nested logit models using maximum likelihood estimation technique. The estimated parameters of the choice models define the utility functions for each alternative with different source and quality – groundwater or surface water. Multivariate regression analyses are employed to test hypotheses based on the statistical significance of coefficients, assess customer's preferences for water supply options, and finally estimate WTP. In this study, data generated from the field is modeled through:

(i) Multinomial Logit Model (conditional) for three supply choices for the entire sample (all classes) to show the importance of attribute-profile in explaining respondent' choice across scenarios; and

(ii) Nested Logit Model for three supply choices for the entire sample (all property classes from planned urban and unplanned peri-urban residential units).

In making a choice, individuals are assumed to evaluate 'alternatives' on the basis of their 'attribute profile' and then choose the alternative that maximizes utility.

The probability of choosing option *i* is given by

$$\Pr ob(i) = \frac{\exp(\mu V_{i)}}{\sum_{J \in C} \exp(\mu V_j)} \tag{1}$$

where $V_i = V(Z_i, S)$ is the indirect utility function, Z_i is a vector of choice attributes, S is a vector of socio-economic characteristics, and μ is a scale parameter, which is usually assumed to be equal to 1 (implying constant error variance). The choice probabilities are estimated by means of a multinomial logit regression, which assumes that the choices are consistent with the IIA property. The most basic form of V_i is an additive structure, which indicates the attributes from the choice sets only, e.g.

$$V_i = ASC + \sum \beta_k Z_{ik} \tag{2}$$

where ASC is an alternative specific constant, β is a vector of coefficients, and Z are attributes from the choice sets. The effects of attributes in the choice sets are captured by the Z variables, while the ASC captures any systematic variations in choice observations that are associated with an alternative that are not explained either by the attribute variation or respondent's observed socio-economic characteristics. It is possible to include socio-economic as well as

attitudinal variables into the utility functions by estimating the variables interactively, either with the ASC or with any of the attributes from the choice set, e.g.

$$V_i = ASC + \sum_n \gamma_n ASC * S_n + \sum_k \beta_k Z_k + \sum_{kn} \delta'_n Z_k \tag{3}$$

where S_n represents socio-economic or environmental attitudinal variables for the nth individual. Taking socio-economic variables without ASC interaction, the purpose of nested logit estimation procedure is not achieved. The nested logit Random Utility Model relaxes the restrictive IIA (Independence of Irrelevant Attribute) assumption to some degree. The choice probability under multinomial logit model for dual quality water supply options (Plan A) is given by:

$$\Pr(Y = Dual) = \frac{\exp(\beta'_{Dual} x_i)}{1 + \sum_{k=0}^{2} \exp(\beta'_k x_i)} \tag{4}$$

The probability that the person chooses dual quality supply *(Plan A)* instead of single quality supply *(Plan B)* is the probability that the unobserved factors for dual quality supply are sufficiently better than those for single quality supply to overcome the advantage that single quality supply has on observed factors. Specifically, the person will choose dual quality supply if the unobserved portion of utility is higher than that for single quality supply by at least 1 unit, thus overcoming the 1-unit advantage that single quality supply has on observed factors (Train, 2003, Chapter 2).

Once the parameter estimates have been obtained, a WTP welfare measure for a policy change that impacts on the environmental good which conforms to demand theory can be derived (Hanemann, 1984; Parsons & Kealy, 1992). Let U^0 represent the utility of the initial (for example, pre-project) state and U^1 represent the utility of the alternative (for example, post-project) state. The coefficient β_y gives the marginal utility of income and is the coefficient of the cost attribute:

$$WTP = \frac{1}{\beta_y} \ln \left[\frac{\sum_i \exp(U_i^{\,1})}{\sum_i \exp(U^{\,0}{}_i)} \right] \tag{5}$$

Therefore, the WTP for dual quality supply is given by:

$$\mathrm{E(WTP)} = \int_0^{\infty} \frac{1}{1 + e^{-(ASC + \sum_n \gamma_n ASC * S_n + \sum_k \beta_k Z_k + \sum_{kn} \delta'_n Z_k)}} d(\Delta y) \tag{6}$$

$$= \frac{1}{\beta_y} \ln[1 + \exp(ASC + \sum_n \gamma_n ASC * S_n + \sum_k \beta_k Z_k + \sum_{kn} \delta'_n Z_k) \tag{7}$$

We have selected the parametric method for two reasons (i) to know the effect of explanatory variables on the probability of selecting a particular scenario, and (ii) to introduce choice specific parameter, which varies across scenarios using more flexible models that use nested structure. "Parametric methods often work fairly well even when the distribution is contaminated or only approximately known, because, the central limit theorem shows that the sum of independent random variables with finite variance trends to be normal in large samples even when the variables themselves are not normal" (Systat Manual 2007: Chapter 2). In practical terms, such differentiation helps to calculate the mean or median WTP assuming that distribution of error is specified correctly to a large extent. This is reflected in the likelihood ratio test which is conducted by fitting two nested models (the restricted and the unrestricted) and comparing the log-likelihoods at the convergence. Most statisticians favour the likelihood ratio test as likelihood is the fundamental measure on which model fitting is based (Maddala, 2001).

4. Data analysis

In the first instance, choice responses are analyzed for planned urban settlements irrespective of any distinction of water quality based on source (groundwater or surface water). The sample population comes from those households who consider improvement in water attributes – quality, quantity and reliability is essential for making an alternate choice. Both multinomial logit and multinomial probit functions are employed to find out any large difference between the coefficients and significance of parameters. In case of planned urban settlements, groundwater dummy variable, household size, daily consumption, awareness level and price of water are found to be significant variables in explaining the difference in probability of selecting an alternative arrangement of water supply irrespective of source distinction. The coefficient on variables is large relative to their standard error and so they appear to be important predictor in explaining the higher choice probability (Note 5).

A positive coefficient on daily consumption and awareness levels means that an increase in these predictors leads to an increase in the predicted probability of choice occasion and paying behaviour, similarly negative coefficients on groundwater dummy, household size, and price of water means that an increase in these predictors leads to a decrease in the predicted probability of choice occasion and paying behaviour for alternate water supply (Table 2). Here, all of the coefficients except awareness level are significantly different from zero at the 99% confidence level. The null hypothesis is that the coefficients on parameters β and α_1 to α_5 are equal to zero. Here both the models contain a constant term; therefore, fitting the two models – restricted and the unrestricted, and comparing the log-likelihoods at the convergence conduct the likelihood-ratio test of the null hypothesis that all coefficients, except the constant are different from zero so that a decision can be made about the significance of the hypothesis. A lower value of likelihood ratio suggests that the observed result is less likely to arise under the null hypothesis. However, in most of the applications using discrete responses, the exact distribution of the likelihood ratio relating to the hypothesis in question is not easy to establish. A convenient way therefore is the distribution of –2log (LR) under certain regularity conditions, which is a chi-squared distribution for large sample sizes. Here, the model likelihoods are -52.25580 and -311.8557 for the MNP model measured using the cumulative distribution function of the standard normal, and twice the difference (519.1998) is chi-squared with six degree of freedom under the null hypothesis. This value can also be calculated by taking the difference of the LR test statistics reported below the parameter estimates. The chi-square is used to test the goodness of fit and test of independence, which indicates, if the observed frequency differs from the theoretically assumed distribution. A chi-squared probability of less than 0.05 is commonly taken as validation for rejecting the null hypothesis and accepting the alternate hypothesis that the explanatory variables are related to the dependent variable. Here the interpretation of coefficients used in MNP model is not as straightforward as used in other regressions. Unlike linear regression, coefficients in quality response models are confounded with residual variation or unobserved heterogeneity, which differs across choice (Williams, 2007). The increase on probability mass of respondents' willingness to pay due to one unit increase in the explanatory variable depends both on the values of the other explanatory variables and the starting value of the given variable. For example, if we hold other explanatory variables constant at zero, the one unit increase in the level of awareness from 1 to 2 has a different effect than one unit increase from 3 to 4 as the predicted probabilities do not change by a common difference (Green, 2003). This happens as variance differs across the respondents so it is rescaled differently. In both MNL and MNP models used here, the coefficients on parameters are standardized inherently, but not in the manner as it is done in OLS (standardizing by rescaling all variables to have a constant variance of one), the standardizing is done by rescaling the variables and error variance so that error variance is either one in probit or $\pi^2/3$ in logit. If error variances differ across respondents, the standardization will also differ, making comparisons of coefficients across respondents inappropriate for a particular variable (Williams, 2007). The slope coefficients reflect these differences. The MNP model results in WTP value of Rs 12.54/kL whereas the MNL model results in WTP value of Rs 12.98/kL for alternate water supply option irrespective of the source distinction between groundwater and surface water.

Table 3 shows the ratio of parameter estimates and preference behaviour of households in unplanned peri-urban areas without making any source distinction between groundwater and surface water. Education and awareness of the respondents is positively correlated with his preference behaviour implying that there is a positive relationship between a respondent's WTP and his number of education years as well as his level of awareness (Louviere *et al.,* 2000). Respondents with personal groundwater bore wells are less likely to pay more than the existing amount for an alternative water supply. This is because they have already invested a significant amount in securing a reliable water supply. The range of monthly bills likely to increase with alternate scenario significantly ($p<.001$) affected the price sensitivity (MacDonald *et al.,* 2005)

The coefficient of current monthly water bill is negatively signed – respondents getting higher water bills appear to be less likely to increase their payments for improvements in water supply. Alternatively, respondents who are getting lower monthly bills are more likely to choose the non-*status quo* option. The negative coefficients for households who have developed a large water storage capacity shows that they have already invested significant amount of money in storing water to avoid unreliable water supply, therefore, their additional WTP for an improved water supply system is actually lower. The results demonstrate that the culture of unreliability in the study area diminishes the willingness to pay for services. Respondents' household size is a significant variable with the negative coefficient meaning larger household sizes would have less likelihood of paying higher for improved water supply (Cai *et al.,* 1998; Hensher, 2004). Similarly coefficient for quantity of daily supply is a significant variable with negatively signed coefficient. In this context, a large majority of the customers receive water between 3 to 4 hours daily and it can be inferred that the level of satisfaction amongst customers in both planned and unplanned areas is very low. Probability of a respondent agreeing to pay higher decreases with increasing bid price (MacDonald *et al.,* 2005; Willis *et al.,* 2005; Raje *et al.,* 2002). Typically the difference between parameter estimates between MNL and MNP models are slight. Both distributions are symmetric and typically yield similar ratios of parameter estimates and likelihood functions (Table 2 and 3). Because each of the parameter estimates is normalized by the standard deviation of the distribution, the ratio of

the parameters estimates would be roughly equal to the ratio of the standard logistic and standard normal distribution scales ($\pi/\sqrt{3} = 1.814$). The test statistic is constructed from the value of log likelihood function under the null hypothesis and log-likelihood (unrestricted) indexes the unrestricted model. The model likelihoods are –261.119 and –402.584 for the probit, and twice the difference (282.92) is chi-squared with seven degrees of freedom under the null hypothesis. As the model employed here uses linear utility function and a symmetric mean zero error, the mean and median WTP with respect to random preferences are equal. Interestingly, the mean WTP in terms of Rs/kl of water supplied in both planned and unplanned areas is similar thereby indicating even in unplanned settlements, households would rather pay for good quality services than get low quality services at reduced price. The monthly bills that they would be willing to pay in these areas are different as their consumption structure is dissimilar – 19.8 kl/month in planned areas and 12.6 kl/month in unplanned areas.

4.1 Multinomial Logit Model (conditional) with source distinction for three supply choices for both the planned urban and unplanned peri-urban areas

Here conditional multinomial logit models have been used as preference behaviour among three alternatives is modeled both as a function of the characteristics of the alternatives, and the characteristics of the respondents making the choice keeping the *status quo* as the base case (0,1,2). The base case or *status quo* is one category of the dependent variable which is chosen as the comparison category. The negative sign on ASC in both the scenarios (dual and single quality supply) shows that choosing the *status quo* option would result in diminishing indirect utility (Table 4). The explanatory variables used here indicate the characteristics of the respondents as well as water supply situations that affect respondents' likelihood of being choosing a specific alternative. Log of income, cost of unreliability, planning class, awareness level, daily consumption, extra duration of water supply, monthly water bill, dummy for water quality, education level and environment dummy (1 if respondents think water quality is a major environmental problem, 0 otherwise) are included as predictors to see their sign and level of significance for both the improved scenario taking data from both planned urban areas and unplanned peri-urban areas. The variable 'planning class' is included to see how this affects in greater likelihood of choosing a specific alternative keeping *status quo* as the base case. Interestingly we get opposite sign for these two scenarios. The sign is negative when the choice is dual, and positive when the choice is single quality supply. This indicates as the level of planning increases, there is a greater likelihood of this alternative being selected as the best alternative. Cost of unreliability though not so significant for respondents choosing the dual supply option (t ratio 1.5728) has positive coefficients in both the scenarios, implying as the personal expenditure increases, the likelihood of choosing the improved scenarios increases. Similarly the level of education has a positive coefficient, but the magnitude of significance varies to large extent between the dual and single quality supply options. It becomes highly significant in choosing the dual supply options (t ratio 8.9353) as more educated people would like to go for better quality of water.

4.2 Modelling preference heterogeneity with source distinction using Nested MNL for three supply choices

The assessment of preferred choice behaviour is based upon estimated parameters and is a function of the random component assumed for preferences. The presence of two sources of uncertainty – parameters and preferences – and the additional source of variation between planned urban areas and unplanned peri-urban areas gives differing set of results. As the partial effect or interpretation of the slope coefficients depends upon the unobserved heterogeneity of the respondents, interpretation becomes useful when the endogenous explanatory variables interact with heterogeneity, in this case – the alternative specific constant. However, the attributes of the choice do not vary with the respondents, only the socio-economic characteristics vary. Therefore we cannot use the ASC to interact with the constant choice specific attributes. This is taken care of in the interaction effect using nested structure where two variables 'extra duration' and 'bid values' vary with respect to the alternatives chosen. In this case sources of heterogeneity are better modelled and controlled for using flexible form of specification such as nested models as determinants of heteroskedasticity can be better attributed.

The estimated results of customers' WTP show that changes in service attributes between dual quality and single quality is large enough to give differing estimates of benefits. As very few households opted for dual quality supply options in unplanned areas, the WTP estimated from MNL (Nested) from combined sample for dual quality shows preference for planned areas only. In planned areas, households are willing to pay Rs 295 per month for decentralized dual quality water. People in planned areas seek collective action to ensure cost minimization by a decentralized treatment option for high quality potable water. The WTP for centralized single quality improved water supply for both planned and unplanned areas put together is Rs 189 per month while the current average monthly bill paid to the Utility is Rs 89. This shows that households are willing to pay more then double their monthly bill for single quality improved water supply with assured reliability.

5. Conclusions and policy implications of the study

The signs on the coefficients under MNL and MNP models for both planned urban and unplanned peri-urban areas make intuitive sense. Overall, these multivariate model results are in accord with economic theory and prior

expectations, and are robust with respect to estimation technique and model specification. The analysis is done for both planned urban and unplanned peri-urban areas segregated on the basis of property tax classification. A large number of households in planned urban areas favour decentralized dual quality water using both local groundwater and municipal surface water. However, single quality improved supply regardless of source distinction becomes the most preferred choice if planned urban and unplanned peri-urban households are modelled together. This preference variation across sampled households testifies 'scope effect', i.e., differential water quality and reliability provisions have differing value estimates between planned urban and unplanned peri-urban areas. By preserving the surface water-groundwater connection, conjunctive management is the preferred strategy for maintaining sustainable supply of a limited resource. However, the public utility must make adequate provisions to maintain safe-yield and control pumpage to prevent local water tables from experiencing long-term declines.

(a) Quality differentiated water with source distinction: The study has shown that it is promising to develop a differentially distribution systems for potable and non-potable water end-uses having heterogeneous customers' preference structure. Accordingly, it is desirable to consider water sensitive approach in the planning phase when developing a master plan for the cities and towns. The system may be desirable from both the customer's preference as well as resource sustainability point of view. With such a kind of system in place, the emergent alternative policy instrument of 'quality based pricing' can modify water use pattern among households across different socio-economic and planning classes. A perceptible heterogeneity in customer's preference provides remarkable lessons to policy makers on the distribution of costs and benefits related to a change in policy.

(b) Decentralized approaches: The study indicates that for a welfare-consistent outcome in water allocation, it is imperative to take decentralized approaches. Even though overall gain in welfare is positive, there exists a significant divergence among the respondents about the extent of these benefits between planned urban and unplanned peri-urban areas. The quality differentiated water supply with source distinction would be economically viable for newer colonies and urban extension due to obvious cost of retrofitting in the older settlements. People are able to support such decentralized options because they increase their wellbeing and hence they enlarge their ability to pay the required contribution from their discretionary income making them financially sustainable. Preference for dual quality water with source distinction between groundwater and surface water is almost negligible in the unplanned peri-urban areas implying that what they primarily need is better water supply. Rural and peri-urban areas adjoining the metropolis are often not well situated to imported surface water from the public water supply due to economies of scale. For communities residing in such areas, groundwater is the most accessible and secure water source. Such communities are concerned with having sufficient water supplies for future growth. If groundwater pumping is restricted because of its effect on adjudicated surface water, growth and development in such areas could be curtailed. The involvement of communities in the conception and the management of socially desirable alternative systems is very critical specially when the natural resource is in limited supply. Because groundwater is easier to access and costs less than water from piped systems, groundwater abstraction cannot be easily regulated. Groundwater management strategies by the local body and the residential society need to ensure sustainability of groundwater development in the future. Groundwater assessment, monitoring and regulation are key strategies for groundwater management in both planned and unplanned areas of a growing metropolis.

(c) Emergence of private capital and market solution: It has been observed from the study that people have deep understanding of water in their immediate environments and tend to cooperate in times of adversity to avoid high transaction costs that would result from limited resource availability. There are several instances of *reciprocal externality* wherein households themselves absorb the cost of over-extraction, in terms of higher pumping cost against declining water tables, and cost of salinity in terms of decentralized treatment cost. In several housing societies, the economies of scale act as externalities leading to an optimum investment in the decentralized treatment technology (such as reverse osmosis or ion exchange plant) and the emergence of a voluntary co-operation by the residents for good quality water. The ensuing economic approach of 'free market' for planned urban settlements generated by the private capital might lead to significant cost reduction as well as social welfare, but it is questionable, as to what extent a scarce resource would be conserved for future generations. Therefore, place for a regulator is strongly recommended.

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Notes

Note 1. Water is a contested resource: though it is often considered a common pool resource, it is rival and excludable in consumption. In many parts of the world, people no longer perceive it as a common good. Access to water reflects power asymmetries, socioeconomic inequalities, and other distributional factors such as land entitlements and planning status (Mehta, 2003).

Note 2. Although there are no comprehensive statistics on how many urban and peri-urban dwellers in Delhi rely on groundwater for their water supply, it is estimated that more than 80 percent of the total population depends partially or fully on groundwater. While 100,000 tube wells were officially registered in 2001, the actual number ranges from 360,000 to 400,000.

Note 3. The gross annual water demand for the city is projected to increase form 2050 million liters per day (MLD) to 4700 MLD in 2021, an increase of 75%, in order to cater for both the present deficiencies and future predicted population growth. Against this growing demand, the net water supply (i.e., excluding leakage and losses) from the 9 supply sources developed till today (2008 level) is only 696 MGD giving rise to a 33 per cent deficit in the net demand.

Note 4. Basically these two groups represent no improvement in quality or supply options, but giving them separately resulted in substantially (and statistically significantly) better estimates of mean willingness to pay than the widely used open-ended approach of allowing respondents to choose from a limited 'menu' of yes-no types without giving them a 'opt-out' choice. This approach reduces 'no response' or negative willingness to pay bias which presents a vexing problem in the contingent valuation studies increasing the number of 'free-riders' in the population.

Note 5. The interpretation is quite different from ordinary regression. Here, the MNL coefficients show how much the logit increases for a unit increase in the independent or explanatory variables, but the probability of a 'no' or 'yes' outcome is a non-linear function of the logit as it is a discrete variable.

Table 1. Difference in model specification as well as benefits of using nested logit model over MNL for reconciling preference heterogeneity

MNL	Elements of the choice sets are statistically independent of one another	$P[(U_{ja} > U_{jb}) = \frac{\exp(\mu u_{ja})}{\sum_i \exp(\mu u_{jb})}$
	The independent variables capture unobserved taste difference which could otherwise cause correlation across alternatives (a condition for homogeneous preference structure)	
	The error terms associated with the various alternatives follows a multivariate logistic distribution	
	The assumption of IID error terms in MNL leads to its infamous property. This restrictive assumption assumes identical error variances across individuals with no correlation in random components across choice occasions (Green, 2003) for people in planned and unplanned areas.	
NL	Flexible covariance structure/ more open	Prob$[U_{tk} > U_{tj} \; \forall \, j \neq k]$ = $\frac{\exp(\alpha_k + \boldsymbol{\beta}' \mathbf{x}_{tk})}{\sum_{l=1}^{K} \exp(\alpha_l + \boldsymbol{\beta}' \mathbf{x}_{tl})}$
	Differential variance for first and second stated choice preference data (covariance heterogeneous)	
	Non-independent errors	
	Inter-class level interactions (e.g. planned vs unplanned choice sets)	
	Non-constant correlation structure across observations	
	Choice based samples to obtain better information about alternatives	
	Clear interpretation of utility function parameters across alternatives	
	Application of the NL with the incorporation of choice specific attributes as explanatory variables as well as ASC induces heterogeneity in the preference structure of the respondents (Ziegler, 2005)	
	Nested logit specification outperforms the more basic MNL specifications with regard to reconciling preference heterogeneity across choice sets (Hensher & Greene, 2003; Louviere *et al.,* 2000)	

Table 2. Comparison of ratio of parameter estimates and other statistics for multinomial probit and multinomial logit models for planned urban areas irrespective of source distinction

Variables	**Coefficient (normal)**	**Coefficient (logistic)**	**Ratio of parameter+**
Constant	-12.6635990	-23.9773729	1.893409
	(-6.347)	(-5.498)	
GWATER_DUMMY	-.43905996	-.83643192	1.905052
	(-2.220)	(-2.351)	
HOUSEHOLD SIZE	-.28770614	-.51057004	1.774623
	(-2.391)	(-2.302)	
DAILY CONSUMPTION	.00134219	.00240689	1.793256
	(2.453)	(2.403)	
AWARENESS	.29084958	.41350775	1.421724
	(1.868)	(1.464)*	
PRICE/kl	-.00317678	-.00616994	1.942199
	(-6.010)	(-5.262)	
BID	-0.9945753	-1.8464431	1.856514
	(-6.754)	(-5.648)	
Log likelihood function (LogL)	-52.25580	-51.54004	
Restricted log likelihood ($LogL_0$)	-311.8557	-311.8557	
Estrella [1-(L/L_0)^(-2 L_0/n)]	.91127	.91127	
Chi squared	519.1998	520.6313	
Prob[ChiSqd > value]	.0000000	.0000000	
Hosmer-Lemeshow chi-squared	1.00699	.57132	
P-value	.60441	0.90297	
McFadden	.83244	.83244	
Mean WTP (Rs/kl)	12.540	12.986	
Mean WTP (Rs/month)	248.29	257.13	

Note: The ratio of estimated coefficient to standard error is asymptotically N (0,1) under the null hypothesis that the coefficients is zero and standard hypothesis testing applies. Here, all of the coefficients except this are significantly different from zero at the 99% level of confidence. The null hypothesis is that the parameters β and α_1 to α_5 are equal to zero.

+ The ratios of respective parameter coefficients indicate that the logit density is almost 1.8 times the probit density as expected for a well-behaved data set.

Table 3. Comparison of ratio of parameter estimates and other statistics for MNP and MNL models for unplanned peri-urban areas irrespective of source distinction

Variables	**Coefficient (normal)**	**Coefficient (logistic)**	**Ratio of parameter**
Constant	-1.83900467	-3.45269559	1.877481
	(-5.372)	(-5.442)	
EDUCATION	.03507168	.03144157	0.896495
	(2.046)	(1.010)	
HOUSEHOLD SIZE	-.17160736	-.32090264	1.869982
	(-6.592)	(-6.285)	
QUANTITY_DUMMY	-.30470228	-.51301725	1.683667
	(-2.070)	(-1.946)	
MONTHLY_BILL	-.00029037	-.00048517	1.670868
	(-1.858)	(-1.729)	
AWARENESS	.22016594	.33292274	1.512145
	(2.617)	(2.169)	
GWATER_DUMMY	-.37703663	-.64226197	1.703447
	(-2.570)	(-2.447)	
BELIEF	.00073714	.00079279	1.075494
	(2.108)	(1.255)	
BID	-.2688606	-.48991235	1.822181
	(-11.294)	(-9.928)	
Log likelihood function (LogL)	-261.119	-248.8049	
Restricted log likelihood ($LogL_0$)	-402.584	-402.584	
Estrella [1-(L/L_0)^(-2 L_0/n)]	.43476	0.46962	
Chi squared	282.9295	307.5594	
Prob[ChiSqd > value]	0.0000000	.0000000	
Hosmer-Lemeshow chi-squared	22.38609	49.94611	
P-value	.00425	0.00000	
McFadden	.35139	0.38198	
Mean WTP (Rs/kl)	11.4509	12.5011	
Mean WTP (Rs/month)	144.28	157.51	

Table 4. Estimation of parameter coefficients with source distinction using multinomial logit model (conditional)

	Coeff.	***Std.Err.***	***t-ratio***	***P-value***
Characteristics in numerator of Prob [Y = Dual Quality Supply]				
ASC+	-8.5938	0.9925	-8.6589	0.0000
Log (INCOME)	0.7349	0.0990	7.4228	0.0000
UNRELC	0.00001	0.0000	1.5728	0.1158
PLANNING CLASS	-0.2720	0.0447	-6.0857	0.0000
AWARENESS	0.5390	0.0800	6.7375	0.0000
DAILY CONSUMPTION	-0.0004	0.0002	-2.5779	0.0099
EXTRA DURATION	-0.0250	0.0136	-1.8406	0.0657
MONTHLY BILL	-0.0033	0.0011	-2.9422	0.0033
QUALITY_EC2	0.6298	0.1598	3.9425	0.0001
EDUCATION	0.2442	0.0273	8.9353	0.0000
ENVP_DUMMY	0.9125	0.1830	4.9870	0.0000
BID	-0.0572	0.0111	-5.1459	0.0000
Characteristics in numerator of Prob [Y = Single Quality Supply]				
ASC	-0.2035	0.4034	-0.5044	0.6140
Log (INCOME)	0.0004	0.0004	1.1931	0.2329
UNRELC	0.0001	0.0000	2.9481	0.0032
PLANNING CLASS	0.2419	0.0402	6.0172	0.0000
AWARENESS	0.6032	0.0728	8.2872	0.0000
DAILY CONSUMPTION	-0.0001	0.0002	-0.8334	0.4046
EXTRA DURATION	-0.0092	0.0124	-0.7416	0.4583
MONTHLY BILL	-0.0046	0.0011	-4.2482	0.0000
QUALITY_EC2	0.7882	0.1405	5.6106	0.0000
EDUCATION	0.0177	0.0152	1.1644	0.2443
ENVP_DUMMY	0.9423	0.1671	5.6386	0.0000
BID	-0.0936	0.0108	-8.6580	0.0000
Log likelihood function	**-2150.631**			
Restricted log likelihood	**-3022.157**			
Pseudo R-squared	**.28838**			

+ ASC is included in the specification to estimate the change in utility associated with choosing the *status quo* alternative when everything else is held constant (partial effect or *ceteris paribus*). It takes up any variation in choices

that cannot be explained by either the attributes or socio-economic variables. The negative sign indicates that choosing the *status quo* option decreases indirect utility.

Table 5. Estimation of parameter coefficients for two scenarios using nested structure under multinomial logit model

Variables	Coefficient	Standard error	t-ratio
ASC_DUAL*	-3.88048620	1.03252163	-3.758
ASC_SINGLE	-2.76757203	.78471756	-3.527
EXTRA_DURATION	.16523668	.01391350	11.876
PAYMENT	-.00413130	.00062691	-1.760
Interaction effects			
ASC_DUAL			
DUA×PLANNING	-.33562158	.07616614	-4.406
DUA× AWARENESS	.56248998	.15107321	3.723
DUA× AGE	-.03886440	.01050529	-3.700
DUA× HEAD	.41415322	.29802436	1.390
DUA× ENV	1.04699051	.32747920	3.197
DUA× EDUCATION	.26606744	.04890373	5.441
ASC_SINGLE			
SIN× PLANNING	.22353802	.06939939	3.221
SIN× AWARENESS	.74980124	.13190306	5.684
SIN× AGE	-.03292063	.00887819	-3.708
SIN× HEAD	.60775243	.25175857	2.414
SIN× ENV	1.10176310	.28798764	3.826
SIN× EDUCATION	-.00066405	.02558244	-.0260
Pseudo R-square			0.449
Log likelihood function			-642.3527
E (WTP): SINGLE QUALITY			Rs. 189.32
E (WTP): DUAL QUALITY			Rs. 295.05

Note: *ASC_DUAL takes the value of one for Dual quality option and zero for Single and BAU options, similarly, ASC_SINGLE takes the value of one for Single quality options and zero for Dual and BAU options. Here BAU option is designated as the omitted level so that the parameter estimates on included levels represent the change from the *status quo* option.

Table 6. Cost and benefit spread of water supply options with source distinction among planned urban and unplanned peri-urban areas

COST SPREAD					
Water supply options	Likely cost (per 1000 L)		Monthly bill for a family of 5 at 165 lpcd (24.75kl)		Total monthly bill
Centralized single quality water without source distinction	Rs 8.50 to Rs 15		Rs 210 to 371		Rs 210 to 371
Decentralized dual quality water with source distinction	Rs 15 (potable) Rs 8.50 (non-potable)		Rs 81 (potable) Rs 159 (non-potable)		Rs 240
BENEFIT SPREAD BETWEEN PLANNED AND UNPLANNED AREAS **Willingness to pay (Rs/month)**					
	Planned areas		**Unplanned areas**		**Planned and Unplanned put together**
	MNL	MNP	MNL	MNP	MNL (Nested)
Centralized single quality water without source distinction	257	248	158	144	189
Decentralized dual quality water with source distinction					295

Table 7. Inter-ward comparisons of water supply provision in the urban and peri-urban areas

Ward	**Saket** (urban)	**Ambedkar Nagar** (peri-urban)	**Vivek Vihar** (peri-urban)	**Shahadara** (peri-urban)	**Karampura** (urban)	**Janakpuri** (urban)
Zone	South	South	Shahadara (South)	Shahadara (South)	West	West
Population	150,000	125,000	75,000	150,000	100,000	200,000
Predominant land use	Residential & Commercial	JJ Clusters (10%) Resettlement Colonies (90%)	Residential (85%) Industrial (15%)	Mixed old area	Industrial & JJ Clusters	Residential (75%) Commercial (25%)
Access to piped water supply	100%	85%	100%	90%	100%	100%
Supply hours/day	3.5	4.2	5.5	5.2	4.5	3.5
Per capita supply (lpcd)	136	227	182	185	227	159
Monthly water bill paid to the DJB (Rs.)	92.80	66.50	85.60	70.48	53.25	98.50

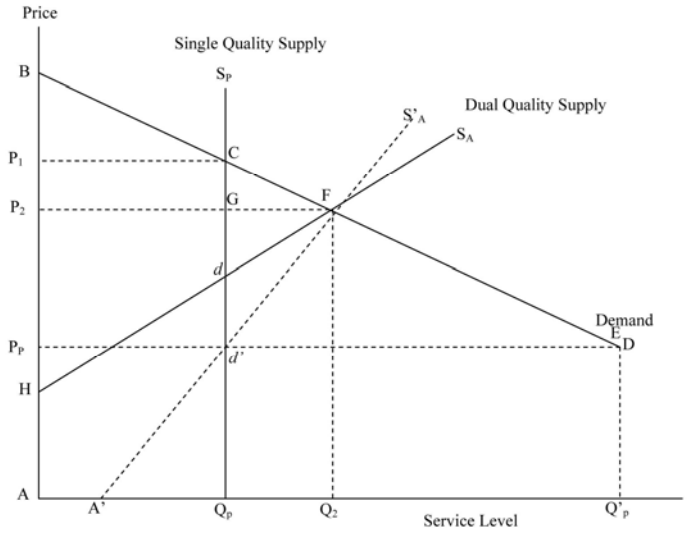

Figure 1. Social optimum and conjunctive use of groundwater and surface water vis-à-vis single quality supply (for a more detailed analysis, see Zekri & Dinar, 2003)

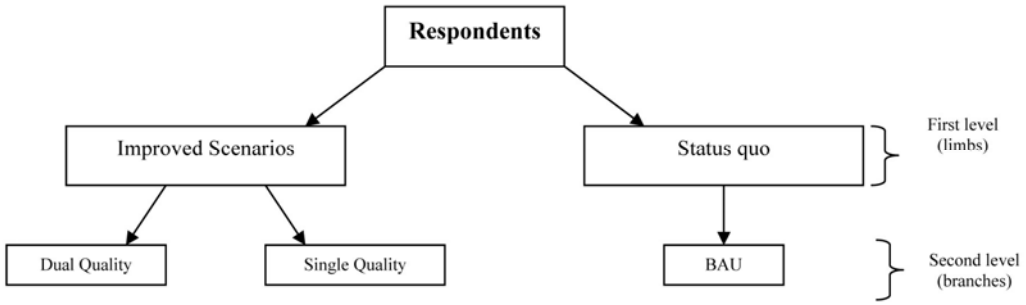

Figure 2. Choice path for the Nested MNLogit used in modelling preference behaviour

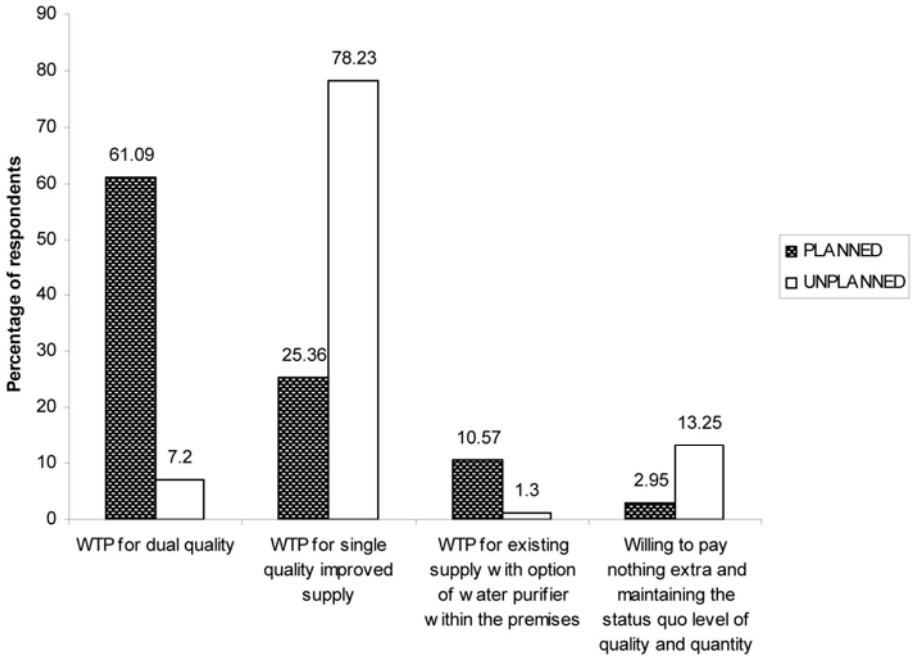

Figure 3. People's preferences for differentiated quality water in planned urban and unplanned peri-urban areas

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A Review on Conflicting Issues in a Deferred Payment Sale Product of a Shari'Ah-Compliant Banking Business

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Abstract

The objective of this study is to look into the proper practices in handling of a product of shari'ah-compliant banking, namely the deferred payment sale (al-bai' bithaman ajil). The elements of violation of shari'ah dictates in dealing with shari'ah-compliant banking practices were identified. This study contributed in term of understanding the issues that need to be improved as innovation at the banking institution level in the form of standard procedural instruction or policy. Exploratory approach to research method was extensively used in this study as such method is relevant for the research issues being studied. The evidences were derived from field work conducted on one type of investment product, al-bai' bithaman ajil of a bank. Capitalizing on the explored and examined shortcomings, improvement on the manner that such shari'ah-compliant banking instrument be handled in efficient and effective ways in order to compete in the intense local and global markets are recommended.

Keywords: Shari'ah, Al-bai' bithaman ajil, Gharar, Riba, Ijab and qabul

1. Introduction

The integration of Islamic banking business within the operation of conventional banking activities into the global banking system will inevitably expose to new challenges in both compliance and legal systems. This is the result of the process of development and complexities involved in arriving at the innovation of Islamic banking products. Of course, our concern is on the arising implications due to an oversight on the substance over form and legal form aspects of the resulted innovation. Apart from this, justice, fairness and ethical practices in the dealings of Islamic banking business need to be addressed.

This paper discussed the issues in handling a product of deferred payment sale, a form of debt financing offered by a bank operating shari'ah-compliant banking business. Currently the premises for offering shari'ah-compliant instruments have already been made available both of mandatory and voluntary in nature. The issues being addressed in here are on the properness of the practices of the offered product so that it is equitable in kind. Such innovation shall reflect the conformance of its *shari'ah*-compliant and free from any form of ambiguity or *gharar.* Despite the impressive improvement in the performance of Islamic banking activities, there are still shortcomings emerged from the ill-equipped system to meet the challenges of customers' demand.

Gregory (1996) commented that in the era of a new revolution, knowledge and applied intelligence are rapidly becoming the keys to survival and success. The innovative and creative approaches in designing of a new branding product shall be viewed as a niche in strengthening the competitive edge of the modern banking. In this regard, it is worth suggesting that the *shari'ah*-compliant investment vehicles be handled equitably.

2. Literature review

The current academic and business interest in Islamic banking and finance is a product of a considerable amount of Islamic resurgence leading to movement for reform and return to basic shari'ah principles in many Islamic countries. Kamel Naser and Maurice Pendlebury (1997) as well as Abdul Magid (1986) demonstrated the appearance of Islamic movement led to the development in term of unified Islamic political and economic system that could have a significant impact on the pattern of international trade.

The legal form for an investment vehicle will involve considering the advantages and disadvantages of the business forms available. In ensuring the legitimacy of an Islamic banking product, its promoter must not only confine it adherence to the national law instead it has to be beyond this spectrum of legal environment. Thus, it also needs to observe on the compliance of *shari'ah,* national regulation, tax structure, accounting and auditing as well as market demand. Stewardship and accountability are important to ensure that investors' confidence is not eroded (Kamel Naser and Maurice Pendlebury, 1997).

The focus of this study is looking into the issues related to the properness in the handling of a specific product using the concept of al-bai' bithaman ajil, a form of debt financing to facilitate the financing of a landed property. It is aimed at improving the manner in which the product is properly packaged and administered so as to benefit both the seller and buyer parties. Information concerning economic events nowadays is getting more complex. This gives rise to increasingly difficult to keep track of resources, to ascertain them and to ensure that they are used for the intended purposes. As such, effort in devising and administering the product must properly be observed. This is in agreement with the assertion that, accounting itself is a product of its environment taking into consideration the social, economic, political and legal conditions (Mohd Nasir, 1993).

Politically, the public has the right to know how the private sector operates in the public interest to maintain a good social image. This is to ensure public acceptance of its existence as part of the economic system (Barton, 1982). As such, in ensuring this properness of product in term of its pricing, placement and in this case its conformance to shari'ah-compliant requirement must be observed.

3. Research Methodology

This study emphasized on qualitative approach using analytical and comparative methods**.** The comparative method was conducted to establish the conformance and permissibility of the operational aspect to that of the *shari'ah* dictates. The terms and conditions and contents of applicable documents to an asset based on a deferred payment sale (*al-bai bithaman ajil)* concept were scrutinized with reasonable in-depth and broad perspective to justify the holistic nature of the issues focused. For the purpose of justifying the acceptable values in operating a shari'ah base banking business, the shari'ah values are defined as information which is relevant to the shari'ah business conducts and dealings.

Currently, development of shari'ah banking products and legal documentations are still following normative approach. This can be traced when looking and scrutinizing closely at the contents of the related documentations. This research uses documentations of a bank dealing with shari'ah way of banking business. It purposely looked into a case that dealt with deferred payment sale contract (*al-bai bithaman ajil).* Thus, this study focused primarily on related documents that are related to such contract.

It was hypothesized in this study that, the existing approaches in handling the shari'ah-compliant banking product of al-bai' bithaman ajil is not equitable to the customers. This hypothesis is thus related to the aspect and manner in which the bank handles the instrument. In evidencing the correctness of the assertion in the hypothesis, relevant documents and dealing records were studied and analyzed.

4. Findings and Discussion

Practically, a letter of offer is to substantiate the elements of offer and acceptance (*sighah)* as one of the tenets in a contract of buy and sell in a deferred payment sale contract. It is a part and parcel of the legal documentations for the specific contract's dealings. In this study, it is related to an asset of a bank utilizing the concept of *al-bai bithaman ajil.* The element of pricing in this contract has been reviewed analytically. The writer found that there was element of multiple pricing within a single contract of the deferred payment sale. This is a form of violation in the contract, leading to ambiguity (*gharar).* There was stipulation of grace period profit (GPP) pricing apart from the sale pricing quoted in there, within sale and purchase contract of a deferred payment sale. Further scrutinizing on the letter of offer, found that, the element of interest was mentioned. There was also presence of penalty interest clause in such document. Such clause appeared in the specific term and condition of the letter of offer which was quoted as follow:

"In the event of any late payment after its due date, in addition to interest or penalty interest that may be charged, the Bank is entitled to levy an administrative charge which the Bank may from time to time stipulate."

This was an evidence of violation to the shari'ah-compliant banking and finance principle of usury (al-riba). This was not in line as what used to be commented by other writers. The condemnation of usury is part of the general condemnation of market abuse, such as exploitation of weaker members of society by deceit, manipulation or restriction (Kamel Naser and Maurice Pendlebury, 1997). In discussing on the existence of physical nature of good or the subject matter of the contract, Islamic banking places it's reliance over the specification of which may not turn to be a real one at the point of delivery of the object or good. Timeliness in the process of preparation and execution of documentations was another issue that needs to be addressed in the case of this study. Inefficiency was glaring in this case, delay in the process may lead to unnecessary interest (*riba*) be imposed by the developer and hence non-competitive. Inadequacy of competency level of practitioners contributed to such phenomenon.

Analytical scrutiny was conducted on the shari'ah-compliant mortgage insurance (mortgage *takaful*) coverage policy. The writer noted that there was element of speculation (*maisr)* in the document. There was a form of manipulation of information to the advantage of the operator. When looking into the application of mortgage insurance cover in this study, it was noted that it was jointly applied aimed at covering property of a common interest to both the joint-applicants. In other word it was earlier meant to cover both parties when making the proposal for such mortgage cover. However, when the policy was issued, it was only be available to protect for the possible economic losses of the

first applicant only, who is much younger in age and not to benefit him for the possible economic losses of the second applicant, who is much older than him as the protection was not being granted. In this regard, it was seen that the takaful operator was taking advantage by gambling on the customer's life. The bank which acted as an agent of its subsidiary *takaful* business has clearly acted in the manner to benefit its *takaful* unit rather than its customer by providing single cover on the possible economic losses of the younger applicant in lieu of his death. This kind of protection is not benefiting the younger applicant in this joint proposal mortgage cover.

The bank should have acted with caution that nourishment or livelihood, life partner and death solely are in the hand of the Almighty. This was a serious offence, as it may be conflicting with the principle of *aqidah* for merely believing that the elderly person may pass away earlier, even though the rule of thumb base on logic may be right. In discussing this a little further, the bank absolutely cannot say that in twenty years from now, the elderly person may pass away earlier than the younger one. Thus, this was another clear evidence of violation of *mu'amalah* principles, in the day-to-day practices of shari'ah-compliant banking business. In this regard, justification on elements of fairness and morality have to be focused in holistic manner with reasonable in-depth. Of course, suggestion on the improvement of approach needs to be considered through formulating universally accepted practices.

Operationally, administering the financing is another crucial aspect of handling shari'ah-compliant banking practices. Numerous issues which were deemed to be the weaknesses in practices need to be addressed. These include the imposition of service charge on every repayments made under a standing instruction even both the financing account and deposit account were held in the same branch office of the bank. Such phenomenon may hinder the effectiveness as well as contributing to element of risk being contested on the ground of technicalities in the event of jurisdiction. This should not be recognized as a procedural aspect of financing administration for administering the asset by the bank as an amount above the element of cost and profit in the case of a deferred payment asset is construed as usury (r*iba)*.

Imposition of maintenance fee as an addition to the selling price was practiced by calling it as administration fee. This is a real danger in legitimizing the illegitimate practice, as it violates the principle of only one price in the contract. In addressing the issue related to the concept of compensation (*ta'widh)* in practice, it seemed to have been imposed on matured or due financing arising from any failure in making repayment by the customer. This is an area that should be handled properly as the bank has to firstly prove whether there is any element of procrastination. This has to be clearly mentioned in the contract.

In exploring the practices of *muqassah / ibra'* or rebate, this study noted that there was element of incompleteness in the documentations of the financing. There was lacking in clarity in the documentations for partial redemption. This should be improvised since it was a norm in banking practices to have this kind of dealing as on-going treatments for any long term assets of the bank. This issue needs to be addressed as it relates to matters in dealing with the asset. Furthermore, Islam encourage one to make decision and act wisely, objectively, efficiently, effectively, fair and just and not oppressive unnecessarily.

Further, another point of interest to seller, buyer, tax authority and employer of the buyer party; is the lack of information in the periodical "statement of account (financing under al-BBA)". In fact those parties are the users of such information. This phenomenon should be viewed as the difference in characteristic of the shari'ah-compliant banking product that has to be made as clear as possible. As such, the statement must show element of selling price, cost and profit outstanding. The rule of set-off must be observed appropriately and correctly as to conform to the principle of fairness to mankind.

Another element of *gharar* or ambiguity that is present in the practices of administration of the asset by the operator was the issue on method of recognition of profit for the respective asset. This was evidence when reconciling the treatment of a lump-sum payment aimed at reducing the progressive released amount. Instead, the result of treatment made has shown that such payment was merely accepted as free money to be utilized in setting of with the periodical progressive profit. The absent of basis in recognizing the income being used, will impair effort to justify the cost of investment on the part of the customer.

Finally, the results of events in dealing with this form of asset of the bank were then recorded detailing all transactions in a statement which supposed to be named statement of Islamic financing account or statement of deferred payment sale account or statement of al-*bai' bithaman ajil* financing account. On validating the existence of this document, it was sad to say that the mindset of bankers who are so familiar with the conventional approach might have overlooked this for still naming it as a loan account instead of al-BBA financing account. The recording of aggregated amount as a single transaction for a number of transactions in a day in a customer's statement would lead to difficulty in handling the process of reconciliation by the customer. This occurrence should be avoided in future dealings.

5. Conclusion

The mission of an Islamic banking institution is to assist in achieving socio-economic justice (*al-falah*). This study found that, there were a few weaknesses that need to be addressed by the operator. In this paper , the writer outlined that,

incompetent personnel has given to negative impact on the handling of *shari'ah*-compliant investment product. This may lead to risk of loosing its niche in term of marketability and confidence in the product, especially from someone who really devoted to dealing with shari'ah-compliant banking operator.

The findings posed in the above discussion are of practical in nature and could easily be understood. Furthermore, they are not difficult to be rectified. The writer hopes that the above findings could be used as evidence for the basis in suggesting an improvement to either the product as well as in addressing the issues related to maintenance to be provided for after the sale to the bank's customer. The writer also suggested that the operator to empirically look into the detail aspects of the product so as to enable it to have a concrete basis in repackaging the product. This is important in ensuring product's sustainability and to remain competitive in business of tense competition.

Dual conflicting functions of *shari'ah* advisor in setting policies and monitoring the business affairs to ensure its compliance with such policies seemed to pose a danger of violating the related procedures and controls. Pratt (1986) suggested that such lack of independence will diminish its effectiveness due to element of potentially conflicting interest. This situation is further worsened due to the ignorance of the true implication of the very complex procedures and transactions brought before the advisor. The lack of precision in the application of *shari'ah* principles to Islamic banking activities is also a contributing factor in hindering the success of this sector particularly in the areas of accounting and banking operation. Since this study is limited to a case of a product, the findings might be affected by such constraint in term of the existence or occurrence of the duly analyzed phenomenon.

Based on this study, the writer concluded that the product of shari'ah-compliant banking must be properly packaged in comprehensive manner. This is important, in order to be competitive, effective and efficient to remain sustainable. The pricing must be compatible to any other similar products in the market, the operator must not miss its focus on the target market segment. Placement of its products too, must be properly planned. Above all, the emphasis on product improvement requires immediate action should be taken into consideration on its re-packaging.

The branding of products and services must not be stored in a long list. The branding must not be in too many varieties as this may lead to practicing discriminating selling and be misleading to the customers. Branding of products must be easily read and mention universally. It must be in simple words, which are easy to mention and understand. Its characteristics must also be easily assessed and has competitive niche or specialty edge. Another aspect of packaging that need immediate action for improvement is on the wrapping of product. Currently, the product is not properly wrapped. This has caused inconveniences to the customer in term of effort, time and cost.

Another aspect which the writer considered crucial to be looked into, is the promotion which includes advertising and product-campaign, the operator of Islamic banking business must realize that, they must propagate and promulgate new idea to motivate the customers to be successful in life in this world and the world hereafter. Thus, in this regard, reliance on findings of research would enable the operators in blending activities of marketing and selling as well as providing maintenance services through proper administration of the asset by the bank. As such, there are numerous immediate future research opportunities for potential researcher in this discipline of study that would enable them to contribute in enhancing the reliability and validity of the Islamic banking practices.

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Investment Analysis of Sovereign Wealth Funds in the world

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Abstract

SWFs play an important role in global financial market. With more active investment, increasingly optimized portfolio and stronger endurance to risk, SWFs are growing fast both by scale and by quantity. In this essay, the status quo of SWFs is discussed at first, and investment strategies are analyzed thereafter. After presenting global investment routes of SWFs, this article finally ends in summarizing their development trends.

Keywords: SWFs, Investment strategies, Development trends

1. Concept and status quo of SWFs

Sovereign Wealth funds are public assets accumulated from certain taxes and budgets, compulsive pension funds, revenues from natural resources and surplus of balance of payments, administrated in the form of foreign currencies by government. Sovereign Wealth Funds (SWFs) refer to the funds set up by government to manage and operate sovereign wealth.

SWFs came into being in 1950s and have been growing fast in latest ten years. They become vital part in merger and acquisition since the worldwide diffusion of the sub-prime crisis and continuous dollar depreciation caused by lower rate in U.S. in 2008. SWFs have been established in 36 countries and areas with total capital of 3.3 trillion dollars which is more than all of hedge funds in 2007, according to International Financial Service London (IFSL). IMF forecasts that foreign assets administrated by sovereignties will reach 12 trillion dollars in 2012, as governments, especially those of emerging countries, increase another international asset of 800 or 900 billion dollars each year.

Insert Table 1 Here.

With the continuous depreciation of U.S. dollars in recent years, both oil-exporting and trade-surplus countries set apart portion of foreign exchange reserves to establish special investment agencies in international market for the purpose of value maintenance and appreciation at the premise of necessary liquidity and security of foreign exchange reserves. The scales of SWFs are rather large because of special capital resource and government background, and will increase rapidly in the short time. Some SWFs are even as same size as government pension funds or central bank reserves.

2. Investment strategy of SWFs

SWFs usually seek for long-term stable revenues from investments in foreign capital market. Investment strategy is mainly based on two considerations: the goal of funds and the rules of accumulation and exit set according to funds' future cash flow. The corresponding asset allocation strategies include goal, expected risk level, liquidity, return rate, investment time period, laws and regulations of funds. Moreover, they should not disturb macroeconomic stableness and domestic financial market, and should be in line with the management policy of foreign exchange reserves by treasury of finance. Compared with other institutions, SWFs pursue for more systematic investment strategy, and therefore, are often conservative long-term investors not for controlling when buying equities. Their goal-setting will work on investment and asset management strategy. For example, stabilization funds for mid-and-short term goals are mainly invested in short-term and low-risk asset portfolios; SWFs aiming at long-term investment obtain high return through the adoption of long-term and high-risk investment portfolio; those against national level risk are usually concerned about trade shocks and hold related assets to offset the impact of losses; and those with a clear liability are required to focus on asset portfolio mismatch and balance sheet risk.

Flyvholm(2007) presents the following investment methods for different countries with different characteristics: 1.For oil-exporting countries vulnerable to global economic recession, Long-term bonds should be in outstanding position in SAA; 2. Net importers of oil and primary commodities such as China may hold oil / commodity price-linked SAA including some industry stocks and primary commodity tracing funds to hedge future price risk;3. Countries aiming at long-term investment such as Norway and Singapore may purchase stocks and other long-term assets to bear more credit risk, return curve risk and liquidity risk in portfolio; 4. Countries pursuing for long-term real returns should buy more TIPS to hedge inflation risk.

In the beginning, SWFs prefer high grade fixed income products and moderate liquidity equity instruments and other long-term, low-fluctuation investments in global financial market for stable increase. However, management styles of SWFs are becoming more active with dollar depreciation and declining rates of US government long-term bonds, and more diversified and risk endurable. This shift emphasizes more on return, so that SWFs can actively expand investment channels, transfer gradually from traditional investments to global diversified portfolios including stocks, real estimates, private equities and other risk assets based on effective risk control. According to Merrill Lynch's report, Middle East countries lead in introducing risk asset investment, followed by Russia and other Asian countries. For example, 34%, 17%, 38% and 11% of KIA are real estate funds, direct funds, stock funds and bond funds respectively. The portfolio of GIC includes bonds, stocks, real estate and equity investment etc., too. Further more, SWFs step in strategic industries such as banks, energy companies, ports and stock exchanges in America and Europe. Take Temasek Holdings for example, its portfolio includes equities of Singapore Airlines, ICICI, England Standard Chartered Bank and some Chinese banks. United Nation's Conference on Trade and Development (UNCTAD) concludes that SWFs have changed FDI pattern. Some old SWFs are good at investing in stock market, but some new ones may move to FDI for controlling stake or significant proportion of the shares.

Insert Table 2 Here

3. Global investment routes of SWFs

According to cash flow direction, SWFs are mainly invested in Europe, U.S. and Asian emerging countries by regions; finance and real estate by industry. In addition, as for financial industry, SWFs are not only limited to bank, but also expanded to hedge funds, asset management corporations, private equity investment institutions and stock exchanges as well.

Insert Table 3 Here

(1) Step in American market via the sub-prime crisis. U.S., Europe and other developed countries are always vigilant and even repellent to SWFs for the doubt of their sponsors' political intensions in the investment. However, the sub-prime crisis starting from the summer of 2007 disrupts their plans and gives SWFs an opportunity to enter U.S. market. There is serious liquidity shortage in financial market due to this crisis, which causes urgent funding need to American financial institutions. SWFs from emerging countries not influenced by the crisis become the perfect liquidity providers. Abu Dhabi Investment Authority (ADIA) from the United Arab Emirates purchased 4.9% equities of the Citigroup by 7.5 billion dollars in Nov., 2007. In the same December, China Investment Corporation acquired convertible equity units from Morgan Stanley by 5 billion dollars. Furthermore, capitals from Singapore, Saudi Arabia, Qatar, South Korea, Kuwait, Japan and so on are invested into UBS, Merrill Lynch, Citigroup and other global financial giants.

(2) SWFs development is relatively slow in Europe due to different attitudes. In Europe, there are two opposite attitudes. England and Italy welcome SWFs but other countries doubt even repelling them. The British Prime Minister Gordon Brown stated that London will become a financial hub for international operations. The Italian Government also announced support for free market access for SWFs, and no country restrictions on potential investors. But German Chancellor Angela Merkel said that they should adopt a "common approach" to review the state-controlled foreign investors in the company's acquisition activities, because SWFs make Europe a totally new environment. In France, a report aimed at protecting their own strategic interests from the impact of SWFs is being drafted. The resistant attitude and strict supervisory will certainly hinder SWFs in European market.

(3) Enlarge investment perspective, keep eyes on emerging markets. Recently, the prospects and investment opportunities in Asian emerging market attract SWFs all over the world. From the perspective of economic development, contribution to the global economy in emerging markets is continuing to rise with a relatively sound economic system, particularly, contribution to the growth of GDP is above 40%. In view of investment return, rate of return on investment in sophisticated market is well below that in emerging markets. It's showed that funds invested in U.S. gained 11.5% and 20.2% respectively in 2005 and 2006, while those invested in Asian emerging markets achieved an average return of 19.9% and 36.9% in the same time. It is such a high return on investment that draws SWFs' attention to emerging markets.

4. Development trends of SWFs

4.1 Development trends of investment strategy

(1) More active investment style and stronger endurance to risks. SWFs were often invested in higher security but lower return products such as U.S. government bonds in the past. However, they are shifted to both higher risk and higher return asset for the reason of continuous rate decline of long-term U.S. government bonds and U.S. dollar weakness. ADIA shares similar investment strategy with western asset management corporations or hedge funds, Dubai and Qatar funds prefer to riskier investment strategies like stock market and private equity funds. It's found in the study of American sub-prime crisis that SWFs are regular buyers of junk bonds.

(2) Expanded investment perspective. SWFs are usually invested in foreign markets and high grade fixed income products and moderate liquidity equity instruments in global financial market at the beginning. But in recent years, they become more active, more aggressive and more portfolio-diversified as the number and size of SWFs increase rapidly. The asset distribution changes from focusing on G7 fixed rate debts to global diversified portfolio including stocks and other risky assets, even to non-traditional investments such as global real estate, private equity, commodity futures and hedge funds. This highly decentralized asset allocation model is conducive to disperse risks and improve earnings.

(3) The rising proportion of self-managed SWFs investments. Some SWFs tend to manage investments by themselves in consideration of management cost, risk and other factors. For example, Norway Global Pension Fund managed 83% of total asset itself, which was 5% higher than 2006 and 6% higher in risk, but 3% lower in management cost at the same time.

(4) Strict discipline and advanced management. Abu Dhabi Investment Authority has a committee consisting of 11 persons to supervise asset distribution strictly. this management model is exactly as same as that of Harvard University and Yale University's donation funds. 60% of Abu Dhabi investment portfolio is linked to a variety of Indices to reduce cost.

(5) Increased portion in equity investment. With the transition from original single sovereignty investment on U.S. government bonds to diversified ones, the true SWFs come into being in recent years for the purpose of discarding traditional investment ideas, making long-term equity investment and focusing on entities. So far, there are 8 SWFs carried out merging or equity investment, they are respectively from Brunei, Canada, China, Kuwait, Malaysia, Qatar, Singapore and the United Arab Emirates. This also promotes FDI in developed countries and may change pattern of FDI in the future.

(6) The increasing investment in financial industry. Home countries of most active SWFs in international market are developing countries in Middle East or Asia, in which development depends on agriculture or manufacturing. Therefore, they choose to invest in financial companies, which is able to disperse economic risks and favor the industrial upgrade. SWFs scramble for financial companies such as banks, securities and asset management corporations since 2006. According to Dealogic, 8 SWFs made 11 investments, amount to 44.9 billion dollars, in 6 financial institutions in Wall Street between March, 2007 and April, 2008. Investment categories involve common stocks, newly issued common stocks and convertible bonds, focused on convertible bonds.

4.2 Development trends of investment pattern

(1) Demand for investment products in capital market is increasing. SWFs' asset management styles, similar to investment funds, pension funds, hedge funds and private equity funds, will cause increasing demand for stocks, bonds, real estate, private assets, derivatives, hedge funds and other investment instruments, and promote the upgrading of valuation standards. Morgan Stanley estimates that net flow of 400 billion dollars' SWFs will enter into global stock markets each year. Among them, 40 billion will enter into infrastructure investment, 60 billion into private equity, 130 billion into real estate, and 30 billion into hedge funds. This will raise global long-term risk-free interest rate by 30-40 basic points and global stock price by 10%.

(2) Third-party asset management and investment service are in need. SWFs commissioned external fund managers for all or part of the management of the Funds. For example, three quarters of SWFs of South Korean Investment Company are managed by external mangers. Furthermore, the demand of SWFs for some products involves market analysis, investment valuation, portfolio selection and management, securities trading and clearing and hedging risk as well in asset management chain; Thirdly, legal and financial services are needed by SWFs; At last, investment brokers are also in need.

(3) Co-operations between SWFs are getting closer. The co-operation is made in the form of the composition of the investment team for joint venture. For instance, Temasek and China National Development Bank share-hold Barclays National Bank, GIC and Saudi royal inject capital in UBS. Another example, Dubai International Capital once planned to unite several Middle East countries and investment institutions to set up joint fund targeted at 15-billion-dollar strategic investment in BP, GE and other world top 100 companies.

(4) Competition in investment market is becoming fierce. There is "two-way" competition: one way is competition of demand for SWFs, which is shown significantly by huge losses in Citigroup, Merrill Lynch and UBS and other international institutions after the sub-prime crisis; another way, SWFs compete for investment projects. Especially, competition for investment project among Middle East countries can be described as "scramble" competition, the bid for OMX between Borse Dubai and QIA is a typical example. In addition, Barclays Bank PLC was strongly supported by two SWFs from China and Singapore in acquisition of in July, 2007.

(5) Higher investment transparency is required and international standards for SWFs to invest may be put on the agenda. As direct or indirect national entities, SWFs are usually not subject to norms of existing laws and regulations for investment funds and pension funds. SWFs and central bank reserves investment are both opaque, because they are not

required to publish information such as investment strategy, daily deals, asset portfolio, trade channels, asset scale, investment management, discipline and derivative usage in most cases. U.S. and Europe strongly require IMF and other international institutions to make related international standards for transparently growing SWFs. Even England, being mildest with SWFs, claims that lowest transparency and supervision standard should be applied to government-backed fund, otherwise SWFs will be seen as the irresponsible ones in global economy. In fact, higher transparency is not only able to enhance trust among trading parties, but also increase credibility on policy process, which benefits SWFs' development.

(6) SWFs will encounter financial protectionism. From the perspective of developed countries, SWFs' merging and acquisition are of strategic intentions and threaten their national securities, and therefore protectionism is roused up. For example, after China National Development Bank and Singaporean Temasek shareholding Barclays Bank from United Kingdom, German government began to wonder whether German banks are acquired by SWFs and examine whether there is a need to set up an institution to review similar mergers and acquisitions. DP World had to give up acquisition intention on P&O which owns the right to operate 6 American ports after U.S. Congress' defense in national security. In addition, developed countries will raise claims and ask emerging countries to further open up capital market in the name of peer-to-peer market opening. U.S. asks for RMB's total liberalization in capital accounts after CNOOC acquisition case.

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Table 1. Types of SWFs

SWFs	classified by capital resource	foreign exchange reserves	Represented by Asian countries and regions such as China, Singapore, South Korea, Malaysia and Taiwan, Hong Kong
		revenues from exporting natural resource	Represented by the Middle East, Latin American countries mainly exporting oil, natural gas, copper and diamonds
		international assistance funds	Represented by Ugandan assistance funds
		other types of national capital	Based on income from fiscal surpluses and privatization of state-owned property in Australia and Ireland etc.
	classified by its purpose	stable type	Smoothing national income inter-temporally to guarantee stable income after the depletion of natural resource and prevent economic and fiscal imbalance caused by price fluctuation , especially oil price fluctuation.
		hedging type	Intervening in foreign exchange market to shunt foreign exchange reserves, offset liquidity surplus and ease depreciation pressure from foreign exchange reserves shoot-up, such as China Investment Corporation
		saving type	Smoothing inter-generational wealth to cope with challenges for the pension system from aging society and natural resource decline and distribute wealth fairly among generations, Such as Government Pension Fund of Norway
		preventive type	Responding to potential socio-economic crisis and development uncertainty
		strategic type	Deploying resources globally to support national development strategy and improving national productivity

Table 2. SWFs' investment strategy and strategic asset allocation

countries/regions	fund name	Establishment	Capital resource	investment strategy and strategic asset allocation
UAE	ADIA/ ADIC	1976	Oil	an important global investor without published SAA
Norway	GPF	1990	Oil	Allotted all over the world with 40% stocks and 60% global fixed assets
Saudi Arabia	unnamed	-	Oil	Invested globally without published SAA
Kuwait	GRF and FGF within KIA	1953	Oil	GRF invested in local, Arabian regional and global financial market; FGF invested around the world according to authorization by board of administration
Singapore	GIC	1981	Others	Invested in almost all global assets without published SAA
Singapore	TH	1974	others	Weight of SAA unknown; 38% Singapore asset, 40% Asian asset, 20% OECD asset and 2% others till March 2006
China	CIC	2007	Foreign exchange reserves	Investment portfolio mainly focusing on international financial products
Russia	Oil stable funds	2004	oil	mainly invested in fixed income assets, 44% dollar assets, 46% Euro assets and 10% Pound assets and divided into two different funds in 2008
Hong Kong	Investment portfolio (HKMA)	1998	other	Two types of assets: sustaining and investing ones
Taiwan	NSF	-	other	-
Australia	GFF	2006	other	Invested domestically
U.S.	APRF	1976	Oil, mineral	53% stocks, 29% fixed assets, 10% real estate and 8% other assets in SAA
Brunei	BIA reserve funds	1983	oil	Invested in global securities, financial assets and real estate, without published SAA
Korea	KIC	2005	other	Global asset allocation, without published SAA
Alberta, Canada	AHTF	1976	oil	Invested globally; 30% fixed assets, 45% stocks, 10% real estate and 15% others in SAA
Chile	ESSF	2006	copper	72% government bonds and 28% currency market instruments; containing dollars, Euro and Yen
Chile	Pension fund	2006		79% government bonds and 21% currency market instruments; containing dollars, Euro and Yen
Botswana	Pula funds	1966	diamonds	Invested in stocks and fixed income instruments in industrial countries, not invested in emerging markets

Sources: IMF. Table 1.7 in Global Financial Stability Report, Sep., 2007; BIS. Table1 in The Management of National Foreign Exchange Reserves Special Funds.

Table 3. SWFs' investment expansion in 2007

Fund name	Invest project/resident industry/project location
Istithmar	Mandarin Oriental NY/Hotel/U.S; Serco Gulf/equipment management/ The United Arab Emirates; Cunard Line-QE2/shipment/United Kingdom; Hans Energy/oil reserves /China; Barneys/retail/U.S; Parks/real estate /United Kingdom
Dubai International Capital	HSBC/finance/United Kingdom; Mauser/industrial package/Germany; EADS / aviation industry/Holland; ICICI Bank /finance/India; Och-Ziff/finance/U.S; Alliance Medical/ medical industry /United Kingdom; Almatis/industrial material//Germany; SONY/Electrics/Japan
Kuwait Investment Authority	EADS / aviation industry/Holland
Qatar Investment Authority	EADS / aviation industry/Holland; Care Principles/medical industry/United Kingdom; London Stock Exchange/finance/United Kingdom; Stockholm Stock Exchange/finance/Sweden; Sainsbury/retail/United Kingdom; Bellway/real estate/United Kingdom
Abu Dhabi Investment Authority (UAE)	Suez Cement/construction material/Egypt; Apollo Management/finance/U.S.; EFG-Hermes/finance/Egypt; Prime West Energy Trust/energy/Canada; NASDAQ/finance/U.S.; Citigroup/finance/U.S.
Mubadala Development Corporation (UAE)	Carlyle Group /finance/U.S.; Advanced Micro Devices/computer devices/U.S.
Dubai Stock Exchange	London Stock Exchange/finance/United Kingdom; NASDAQ/finance/U.S.
Khazanah (Malaysia)	Infrastructure Development Finance Corp/finance/India; Yes Bank/finance/India
Temasek (Singapore)	Tata Sky/ Satellite TV /India; Zhongsin / Forest /Hongkong; 9D Salt Corporation /light industry /China; Minh Phu Seafood/ Fisheries /Vietnam; First Flight Couriers/post/India; Citic Resources Holdings /oil/Hongkong; ABC Learning center/childcare/Australia; Barclays Bank /finance/United Kingdom; Standard Chartered Bank /finance/United Kingdom; Merrill Lynch & Co. /finance/U.S.
Government Investment Corporation (Singapore)	CSC-Metro Center/real estate/United Kingdom; Westfield Parramatta/real estate/Australia; Hawks Town/real estate/Japan; Merrill Finance Center / real estate /United Kingdom; WestQuay Shopping Center/ real estate /United Kingdom; Myer Melbourne real estate/ real estate /Australia; Chicago InterContinental Hotel /hotel/U.S.; Hyatt Regency La Jolla/hotel/U.S.; Lasalle-Kungshuset/ real estate /Sweden; UBS/finance/Switzerland

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Commercial Bank Selection: Comparison between Single and Multiple Bank Users in Malaysia

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Abstract

This paper presents an empirical study of selection criteria employed by single and multiple bank users and to see if certain personal characteristics can be used to differentiate these two segments. The study chose to sample a specific consumer segment in Malaysia, namely the young-adults, which have not been given enough attention in the literature. Selection factors of which both single and multiple bank users had variation were attractiveness, branch location, ATM service, financial benefits and secure feeling. Multiple-bankers appear to place significantly more importance to all these factors. Female customers engage in multiple banking significantly more than their male counterparts. The implications of the findings were discussed and opportunities for future research were provided.

Keywords: Bank selection criteria, Single bank users, Multiple bank users, Young-adult, Malaysia

1. Introduction

Multiple banking, also called split-banking occurred when people employed two or more bankers to handle their personal financial affairs (Denton & Chan, 1991). Chan (1993) stated that multiple banking exists where the same person uses the same service at two or more banks. Whereas, definition of multiple banking given by Gerrard and Cunningham (1999) focus on product specific which relate to savings account. They stated that multiple banking exists if a customer maintains a savings account at two or more banks. This approach is justified for this study because it is known that saving account is used by almost all young-adult consumers in Malaysia particularly undergraduate students.

Multiple banking, where it exists, has obvious advantages for both banks and customers (Gerrard & Cunningham, 1999). For a bank, multiple banking creates an extra relationship with customers, which is good from a statistical point of view. From a customer's perspective, multiple banking enable a customer to access a wider range of ATMs, possibly a wider range of financial services and the ability to negotiate a better deal on financial services such as a loan.

Single banking also has certain advantages for both banks and customers. The benefit of a single banking relationship over multiple ones is that it can save overall monitoring costs (Diamond, 1984) and transaction costs. Single banking creates efficiency within the banking system due to non-duplication of certain service provision (for example, saving account passbook or sending out of regular account statements). Some customers may desire to maintain relationship with one single bank to save time, cost and effort, especially if the bank is able to provide more integrated services and implement a customer-centric strategy to satisfy their banking needs.

Despite its significance, the issue of single versus multiple banking is not one which has been over-researched. Instead, the major focus of studies in the bank marketing literature was either the taxonomy of banks' customers or attempted to determine the bank selection criteria employed by individual customers (for example, Kaufman, 1967; Reed, 1972; Mason & Mayer, 1974; Anderson, Fox & Fulcher, 1976; Kaynak, 1986; Boyd, Leonard & White, 1994; Hon & Tom, 1994; Holstius & Kaynak, 1995; Zineldin, 1996). Relatively less effort has been directed towards identification of

choice criteria factors employed by single and multiple bank users. Some of those who have published information about the practice have done so in what can be considered as a side issue (cf. Gerrard & Cunningham, 1999) and the population of interest in these studies has been the general population. Far less is known about the multiple banking behavior of young-adult segment with Gerrard and Cunningham (2001) is being the only study of note.

Considering the limitations in the studies conducted to date, the purpose of this study is to compare the selection criteria employed by single and multiple bank users and to see if certain personal characteristics can be used to differentiate a multiple bank user from a single bank user. It was predicted that significant discrepancy would exist between single and multiple bank users with regard to the importance of bank selection criteria.

This paper would make contribution by providing bank marketers with an enhanced understanding of the factors which influence selection of single and multiple bank users, which will enable them to tailor marketing efforts towards attracting such account holders. The findings of the study would also contribute to the very limited knowledge presently available about banking behavior of young-adult consumers in Malaysia, which has not been given much attention in previous studies.

The remainder of this paper is divided into six sections. The next section provides an overview of Malaysian banking sector, followed by a general overview of young-adult segment and its significance to financial service providers. Next presented is a review of previous studies, research methodology, empirical results and finally concluding comments.

2. The Malaysian Banking Sector

The Malaysian financial system comprises the banking system and the system of non-bank financial intermediaries. The banking system includes the Central Bank (Bank Negara Malaysia), commercial banks and also several important non-financial institutions which are closely linked to the monetary institutions. These institutions are the finance companies, merchant banks, discount houses and the money and foreign exchange brokers. The non-bank financial institutions, apart from the above, include development finance institutions, saving institutions, provident and pension funds, insurance companies, building societies, unit trusts and other special investment agencies.

Commercial banks play a vital role in the Malaysian economy for two reasons; first, they provide a major source of financial intermediation and secondly, their checkable deposit liabilities represent the bulk of the nation's money stock. By the end of 2008, there were 39 commercial banks in Malaysia including 17 Islamic banks. Of these, there were 20 domestic banks and 19 locally incorporated foreign banks which operate in Malaysia (Bank Negara Malaysia, 2008). Commercial banks constitute the largest and most important group all of financial institutions in Malaysia with total assets of approximately MYR1,231 billion as at 30 June 2008 (The Association of Banks in Malaysia, 2008). In December 2008, total deposits with the banking system increased significantly by MYR29.3 billion or 11.9 per cent on an annual basis (November: MYR9.6 billion; 12.4 per cent), reflecting mainly higher deposit placements by financial institutions, business enterprises, and individuals (Bank Negara Malaysia, 2008).

Expansion in the commercial banks in Malaysia has also been in terms of increasing numbers of bank branches. As in May 2009, the domestic conventional banks had a total of 1725 branches, concentrated among the nine anchor banks: CIMB Bank Berhad (360), Malayan Banking Berhad (277), Public Bank Berhad (243), AmBank Berhad (165), EON Bank Berhad (136), Hong Leong Bank Berhad (185), RHB Bank Berhad (186), Affin Bank Berhad (84) and Alliance Bank Berhad (89). The domestic Islamic banks also proved to be viable banking institutions in the country with a total of 1983 branches, exist side-by-side with those conventional banking institutions.

Foreign banks also continued to play an important role in the economy. As in May 2009, there are 19 foreign banking offices with a total of 233 branches all around Malaysia, dominated by United Overseas Bank (Malaysia) Berhad, having 41 branches, followed by HSBC Bank Malaysia Berhad (40), The Standard Chartered Bank (M) Berhad (38), Oversea-Chinese Banking Corporation (M) Berhad (29) and Al Rajhi Banking & Investment Corporation (Malaysia) Berhad (19).

The evolution of the banking industry in Malaysia has led to conventional banking products and services, such as deposits and loans/hire purchase, taking on more sophisticated and advanced features such as phone banking, auto pay, auto-debit, ATMs and online shopping and banking. These features are facilitated by advanced technological developments that allow bank customers easier and simpler methods and processes of going about their daily banking. The scenario gives a significant impact on changing customer behavior in banking.

In addition to improving banking features and methods, it has also led to the introduction of new products and services like credit and debit cards, investment products (insurance and unit trusts), financing products and services (trade and share financing), trade and credit facilities, remittances, loans to priority sectors and Islamic banking.

As the financial reforms changed the environment, this have resulted with new business opportunities and increased competition. This development also further strengthened the incentives for improved performance among banks to fulfill customer's needs. This is due to the behavioral changes among customers that is believed do not solely caused by

the modification of the consumers' perception of a given business in relation with the competitors, but also on the introduction of new attributes or products for consumer consideration.

3. The Young-Adult Market

Increasing levels of competition in the banking industry (Grady & Spencer, 1990) and similarity of financial services offered by commercial banks (Holstius & Kaynak, 1995) led financial providers to seek new market segments. It is in this context that college students became a focus of attention in the bank market both as a source of new accounts and future profitability. Despite the fact that the majority of college students are unemployed and their 'earning' comes mainly from educational loans and parental contributions, they provides an excellent business opportunity for commercial banks for several reasons.

First, the student market is expanding and has become lucrative. With the expansion of tertiary educational services, which resulted in the establishment of 20 public universities and many more private colleges, the number of students in further and higher education has been increasing steadily over the years. Recent statistics showed that the number of students entering local public universities for undergraduate studies rose dramatically from 29,962 in 2001 to 58,304 in 2006 – a 95 per cent increase within a five year period (Ministry of Higher Education, 2007). The government policy to have at least 35% of the labor force with tertiary education should see this growth continue in the future (Government of Malaysia, 2001).

Secondly, college students are likely to need a bank account to negotiate their educational loans or parental contribution and may be obliged to administer their own personal financial affairs for the first time. Those who do not yet have bank accounts will need to open one as they started college because all grant providers pay allowances directly through students' bank accounts. Despite their relatively basic banking needs, students are to some degree a captive audience and at the stage in the purchase cycle where they may be more responsive to marketing activities from financial institutions (Thwaites & Vere, 1995).

A third important feature of the student market is the potential for above-average profitability in the future. Lewis (1982) commented that "the banks believed that it might well be in their interest to attract these young people to open accounts as they started college in the anticipation that they would remain, after graduation, with the bank and be profitable, in the long term, to that bank" (p. 63). The underlying logic of this comment is that college student is the segment of the population who has the potential of earning a greater income than any other segment of the population. Only college educated individuals have a significantly higher than average chance of rising from the low income group into the middle class (Duncan, Smeeding & Rodgers, 1992). Specifically, as compared with non-graduates of the same age, graduates should normally secure more highly paid employment, to have a more progressive career and hence, develop a need for a wider range of personnel financial services as they pass through their own life cycle. Thus the ability to develop a presence in the student market through appropriate acquisition and retention strategies is therefore likely to have an influence on banks' future market share and profitability (Thwaites & Vere, 1995).

Finally, although students have a high purchasing power especially with the availability of educational loans and parental contribution, college students in general tends to be good savers (Azis, Aziz, Mohd-Sanusi & Abd-Hamid, 2006). Increases in tuition and cost of living expenses forces them to manage their money wisely and save a small portion of allowances they received from parental contribution and loan providers while they attend classes. A study by Sabri and Masud (2002) on financial socialization among university students in Malaysia found that adolescence started receiving allowances, have own accounts, make own savings and handle own expenses at an earlier age. Their study produced evidence to show that a substantial proportion of students open their bank accounts before arriving at college or university. They found that, among a sample of university students, 36.3 per cent have own bank accounts opened whilst at primary school (aged 7-12) and 37.1 per cent whilst at secondary school (aged 13-17). These findings clearly indicate the potential of young consumers as a profitable target segment attractive to bank marketers.

4. Previous Studies

This section reviews the studies that have been carried out to date. The review will deal firstly with the literature pertaining to bank choice criteria employed by college students and then focus specifically on issues relating to multiple banking behavior.

4.1 Bank Selection Criteria

A limited number of studies dealing with the topic of bank selection criteria of college students have been conducted in the West. One earlier study reported by Lewis (1982) indicated that 92 percent of the first-year college students in Manchester thought they would stay with their present bank until the end of their course while 44 percent believed they would continue with the same bank. While, 80 percent of the final year students believed they would continue with the same bank even after graduation. A study by Thwaites and Vere (1995), also conducted in a British setting, showed that proximity of an ATM to college, free banking service and overall student offer were the top three selection criteria employed by college students in selecting which banks to patronize.

In his article about American college students, Schram (1991) pointed out that convenience remains the primary reason why most college students choose their banks. Other than that, family tradition and loyalty to the banks seemed to be the important factors for college students. Meanwhile, Khazeh and Decker (1992-93) identified the following factors as the most important determinant attributes of bank selection decisions: service charge policy, reputation, interest charged on loans, quick loan approval and friendly tellers.

In Singapore, Huu and Kar (2000) found that undergraduates place high emphasis on the pricing and product dimensions of bank services. Where as, the third party influences were found to be the least important selection criteria. Gerrard and Cunningham (2001) surveyed a sample of 184 Singapore's undergraduates found that the most important dimensions in bank selection are "feel secure", followed by "electronic services" and "service provision". Consistent with the findings of Huu and Kar (2000), the "third party influences" was found to be the least important dimension.

Almossawi (2001) also conducted a study in Bahrain to examine the bank selection criteria employed by college students. He found that the key factors determining college students' bank selection were: bank's reputation, availability of parking space near the bank, friendliness of bank personnel and availability and location of automated teller machines (ATM).

More recently, Pass (2006) in his surveyed in a large metropolitan area of the Western United States had obtained information about the reasons for students switching banks and selecting new banks. Results stated that pricing and convenience were found to be the principal reasons for selecting a new bank and 'hypothetically' switching banks.

4.2 Multiple Banking Behavior

Although multiple banking behaviour of Malaysian consumers has not been studied in a scholarly context, relevant literature on this topic using data from other countries can be found. Chan et al. (1993) established that 70.6 per cent of a Singapore undergraduate sample practiced multiple banking. Study by Gerrard and Cunningham (1999), using a sample of adult Singaporeans, found that 76.8 per cent of the respondents engaged in multiple banking. Chan (1993) found that 70 per cent of a Hong Kong undergraduate sample practised multiple banking. A study by Kaynak and Kucukemiroglu (1992) also conducted in a Hong Kong setting; showed that 83 per cent of the respondents engaged in multiple banking.

Burnett and Chonko (1981) in the USA and Gerrard and Cunningham (1999) in Singapore sought to distinguish multiple bank customers from single bank customers using various demographic and psychographic characteristics. Both studies were able to identify distinguishing demographic characteristics while only Burnett and Chonko (1981) found differences in psychographics.

Denton and Chan (1991) ranked the selection criteria of multiple bank customers in Hong Kong. They reported that multiple bank usage was widespread and was heavily influenced by factors such as a desire for risk reduction and improved convenience in terms of number of branches and automatic teller machines, to benefit from the known relative advantage that one bank had over another and to meet product prestige needs. Statistically significant differences were found in the evaluation of the relative importance of these factors on multiple banking behaviour based on sex, age, marital status, income and education discriminators. Lam and Burton's (2005) qualitative study on business customers in Hong Kong indicated that specialized bank skills, perceived risk and a perception of having a better negotiation position were identified as a key factor influencing the choice to use more than one bank.

Gerrard and Cunningham (2001) collected responses from a sample of young Singaporeans about various choice criteria from those who were multiple bank users and made a comparison with those who were single bank users. Of the seven choice dimensions that were compared, only convenience was found to be significantly different. Devlin and Gerrard (2005), in their British study, analyze the relative importance of various choice criteria for main and secondary banks and highlight their differences. Their study exhibited marked differences between selecting a first and secondary bank. Recommendations from others were found influential and significantly more important in prompting choice of secondary bank but it less influential in terms of overall ranking of importance. Service expectation and low fees/overdraft charges were found less significant in prompting secondary bank choice.

5. Methodology

5.1 The Questionnaire and Variables

A structured questionnaire was prepared for use in the survey based on literature review and objectives of the study. The questions were organized into three sections according to the following topics: bank selection criteria, banking behavior and personal background.

The first section of the questionnaire asked respondents to rate the relative importance of 29 bank attributes when choosing which banks to patronize. They were measured on a five point Likert-type scale of importance ranging from 1 (not important at all) to 5 (very important). The list was based on previous similar studies (Thwaites & Vere, 1995; Almossawi, 2001; Gerrard & Cunningham, 2001).

The second section of the questionnaire sought to obtain information on the banking behavior of respondents. The respondents were asked for the name of banks at which savings accounts were maintained; which bank was the respondent's main bank (in this study, the term "main bank" was defined as the bank with which the respondents conducted most of their transactions); and which was the respondent's subsidiary bank(s). The length of time that customers have been with their banks was also measured. Finally, to obtain personal background of the respondents, questions regarding their gender, age, ethnicity, faculties and course studied included in the last part of the questionnaire.

To determine the potential effectiveness of the questionnaire and whether further revision is needed prior to conducting the survey, the questionnaire was pilot tested. In addition, the pilot study was conducted to ensure the validity, sequence and relevance of the questionnaire to this study. It should be noted that the test was not used for statistical purposes and therefore responses from the pilot test were not included in the research findings.

The researcher distributed the questionnaire to 20 undergraduate students as a sample group. The subjects were asked if they had any problems understanding the questionnaire or have specific comments regarding the questionnaire. The format for responding was through open-ended questions. The subjects were encouraged to be very free with their responses, make suggestions for improvement and delineate any difficulties they found.

After each questionnaire was completed, each subject was asked what he/she meant in checking various answers. Comments were solicited on the clarity of the questions and what the changes should be done in order to make the questions simpler. These respondents also gave their comments on understanding the instructions about the scaling and the time taken to answer the questions. The test found no serious problems and minor amendments were made to the survey questions based on the verbal feedback received from the interview. The final result of the pilot test finally indicated that the questions had face validity.

5.2 Sample

The sample for this study was selected from among undergraduate students of Universiti Malaysia Terengganu, who were registered on a range of degree courses. Given the nature of the study, a non-probability (convenience) sampling was chosen. To obtain a representative cross-section of the population, the sample was drawn from a wide range of schemes of study from all four faculties.

Since this is an exploratory study, a sample size of 350 thought to be an adequate one. Self-administered surveys were distributed in January 2007. The survey was taken in a controlled classroom environment; allowing for a stronger research design. Specifically, the researcher read a standard set of instructions to the class, informing them of the survey purpose and conditions and encouraged their participation in the study. Students were assured of the confidentiality of their responses and their names were not solicited. They were given approximately 20 minutes to complete the questionnaire and were prevented from communicating with each other while the survey was in progress.

From a total of 350 questionnaires distributed, 323 were returned, out of which 281 were deemed usable (valid and completed), thereby yielding a response rate of about 87 percent. Such a response rate was considered sufficient for statistical reliability and generalizability (Tabachnick & Fidell, 2001) and most satisfactory especially when compared with earlier research works on bank selection decisions (Khazeh & Decker, 1992-93; Huu & Kar, 2000; Gerrard & Cunningham, 2001). This relatively high response rate was attributed to the self-administered approach undertaken in distributing questionnaires.

6. Analysis and Results

6.1 Profile of Respondents

Examination of the respondents (N=281) indicated a majority of females (60.1 per cent) compared to males (39.9 per cent). The over representation of female respondents is expected since the population of students in universities in Malaysia is 60 per cent females and 40 per cent males (Ministry of Higher Education, 2007). 40.6 per cent of students describe themselves as studying social science schemes (marketing, accountancy, social policy, maritime management and counseling) compared to 59.4 per cent science and technology. Ages of respondents ranged from 20 to 27, with a median age of 21.9 years ($\pm$ s.d. 1.19). In terms of ethnic group, about 82.3 per cent of the respondents were Malay, 7.8 per cent were Chinese and 4.3 per cent were Indian.

6.2 Number of Banks

The respondents were asked the number of banks at which their saving accounts are maintained. As seen in Table 1, 18.5 per cent of respondents (52 of them) engaged in single banking and thus, 81.5 per cent were engaged in multiple banking.

6.3 Bank Selection Criteria

To determine the underlying dimensions in the set of bank selection criteria, the importance ratings for the 29 evaluative

criteria were factor analyzed. Factor analysis is a technique which is used to "reduce a large number of variables to some smaller number by telling us which belong together and which seem to say the same thing" (Emory & Cooper, 1991). This technique was deemed to be appropriate for this particular analysis because banking selection factors have many connotations. As noted by De Vaus (2002), such factors are not single measurable entities but are constructs of a number of other directly observable variables. By factor analysis, these observable variables can be clustered into factors, each reflecting an underlying property, which is commonly shared by a certain group of variables (De Vaus, 2002). It also helps to validate that respondents are able to distinguish between the various variables despite the similarity of the items questioned.

Factor analysis was deemed appropriate for the items because the Keiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy test index was higher than the acceptable limit of 0.5 (KMO = 0.723) and Bartlett's test gives a significance level of less than 0.0001 confirming the appropriateness of the factor model (Hair, Anderson, Tatham & Black, 1998). The analysis yielded a nine principal components solution, which together explained more than half of the variance observed in the variables (61.84 per cent), which satisfies the percentage of variance criterion for social science research (Hair *et al*. 1998). The factor groups of bank selection items, their factor loadings, eigenvalues of each factor and per cent of variance explained are given in Table 2.

6.4 Description of Bank Selection Factors

Factor 1, accounting for 10.5 per cent of the total variance, identifies a dimension based on "attractiveness" of the bank including exterior and interior décor of bank building, appearance and friendliness of bank personnel, bank atmosphere and class of people who patronise the bank.

Factor 2 containing items related to recommendations of friends and relatives, influence of parents and lecturers and reception at the bank. This factor has been labeled "people influences" and it accounts for 9.17 per cent of the total variance.

Factor 3 accounts for 7.57 per cent of the total variance. The factor has four items loaded on it namely regular bank statement, professionalism of bank staff, appropriate range of service and variety of service offered. This factor may be labeled a "service provision" factor.

Factor 4 has been labeled "branch location". Three items loaded on this factor namely convenient branch location, several branches and convenience location of the main branch. This factor accounts for 6.32 per cent of the total variance.

Factor 5 containing two items related to financial stability of the bank and confidentiality of information. This factor may be labeled "secure feeling". The factor accounts for 5.84 per cent of the total variance.

Factor 6, explaining 5.79 per cent of the total variance, is seen as a "marketing promotion" grouping, the promotion activities being free gifts for customers and influential marketing campaign.

Factor 7 relates to "ATM service", more particularly the availability of ATM in several locations, 24 hours availability of ATM service and convenience ATM locations. The total variance accounted by this factor is 5.72 per cent.
Factor 8, which explains 5.63 of the total variance, has two items loaded positively on it, namely proximity to university and proximity to home. This factor has been labeled "proximity".

Factor 9 accounts for 5.3 per cent of the total variance. The factor can be labeled "financial benefits", and this relating to low service charges and low interest rates on loans.

6.5 Reliability Analysis

To assess the internal consistency of each factor group obtained, a reliability analysis was carried out (Table 3). The assumption behind this approach is that the items of a measure work together as a set and should be capable of independently measuring the same construct. The items should be consistent in what they indicate about the concept being measured. The Cronbach alpha was used to measure internal reliability by unit weighting items with salient loadings in a factor where Cronbach's alpha coefficient at 0.5 or higher was considered acceptable (Kerlinger & Lee, 2000). These factors produced alpha coefficients between 0.526 and 0.796, indicating high internal consistencies and reliability.

6.6 Ranking Importance of Bank Selection Factors

Table 4 presents the ranking importance of bank selection factors of single and multiple bank customers. Two factors appearing at the top of the lists, namely "secure feeling" and "ATM service" are most influential in the selection decision of both single and multiple bank users. "Service provision" is ranked third for the single bank users but sixth for multiple bank users. "Proximity" came next in terms of relative importance which is ranked fourth in each case.

The matter of "financial benefits" is seen in the fifth/middle group for the single bank users but ranked third for multiple bank users. "Branch location" being in the sixth place in terms of relative importance for the single bank users,

is ranked fifth by their counterparts. The least important three selection factors for young people (for both single and multiple bank users) are "promotion", "attractiveness" and "people influences".

6.7 Comparison between Single and Multiple Bank Users

Table 5 shows the results of the t-test that were used to examine the statistical difference between single and multiple banking undergraduates with regard to various bank selection factors. The null hypothesis that there is no difference in means between groups is rejected if the t-statistic is sufficiently large to be significant. Following the precedent of previous studies, the probability level accepted for statistical significance of t-statistic in the present study was set at $p < 0.1$, showing there was 10 per cent probability that the result occurred by chance. At the 0.05 level, factors of which both samples had variation were "attractiveness" ($t = –2.18$, $p = 0.033$), "branch location" ($t = –2.111$, $p = 0.036$) and "ATM service" ($t = –2.338$, $p < 0.022$). "Financial benefits" ($t = –2.636$, $p = 0.01$) factor was significantly different at the 0.01 level while "secure feeling" ($t = –1.691$, $p = 0.096$) was at the 0.01 level. Multiple-bankers appear to place significantly more importance to all these factors.

6.8 Characteristics of Single and Multiple Bank Users

Table 6 shows three characteristics which were used to distinguish multiple bank users from their counterparts. It can be seen that female respondents engage in multiple banking significantly more than their male counterparts. Race and the course being studied show no significant differences.

7. Concluding Remarks

The importance of this study can be viewed from two dimensions: theoretical contribution and practical implications. Theoretically, the study fills an important gap in the literature by examining bank selection criteria of single and multiple bank users with particular reference to young-adult consumers in Malaysia. This study established that 81.5 per cent of its respondents engaged in multiple banking. The analysis also revealed the existence of a significant variation between single and multiple bank users in the following selection factors: attractiveness, branch location, ATM service, financial benefits and secure feeling. Multiple-bankers appear to place significantly more importance to all these factors. Such findings exhibit some consistency with those of previous studies. For example, Gerrard and Cunningham (2001) found convenience factor was rated significantly higher by multiple bankers while Devlin and Cunningham's (2005) study indicated that the process of choosing a secondary bank is strongly influenced by the incentive offered by banks. In addition, the study found that female customers engage in multiple banking significantly more than their male counterparts.

The results of the current study can carry significant managerial implications for retail bank marketing. Retail banks generate new accounts by routinely promoting products and services to college students. Prospecting for new student customers is an ongoing and challenging task. Therefore, it is essential for bank marketers to know the degree to which various bank attributes are important and how these factors influence students' choice of their banker. Armed with this knowledge, bank marketers can focus on relevant features and benefits when interacting with potential student customers. Retaining them as customers poses another challenge, so it is also important to know how well banks in the marketplace perform on certain attributes. In the light of such information, bank marketers can tailor their marketing strategies to ensure that they emphasize attributes which are the most important in prompting choice and ones that can differentiate a bank from its competitors.

As with any empirical study, this study also had certain constrains that must be considered when assessing the outcomes of its findings and implications. This study poses generalizability questions because the sample frame used is the undergraduate students and thus the results do not represent the banking behavior of the general public. This study need for replication using a larger, more representative sample in order for the findings to generalize the population. This larger-scale replication could be used to produce even more specific strategies for Malaysian banks. As the present study focus on young-adult consumer segment, it would be interesting to examine the underlying factors influencing multiple banking behavior of the business organization such as small and medium enterprises.

For comparative purposes, the future research could be replicated with a sampling frame composed of consumers with a different cultural background such as foreign students or expatriate. Furthermore, the study could have been improved by conducting qualitative interviews with individual single and multiple bank customers to ascertain other influences factors not identified in this analysis, and also can examine dimensions that influence customers to engage in switching behavior from one bank to another.

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Table 1. Number of banks at which saving accounts are maintained

Number of Banks	*n*	Percentage
1	52	18.5
2	140	49.8
3	73	26.0
4	13	4.6
5	2	0.7
6	1	0.4
Total	281	100.0

Table 2. Factor groups of the bank selection criteria

Factor and Items	Factor Loadings	Eigenvalue	% of variance
Factor 1 – Attractiveness			
Attractiveness of bank building	0.850	4.632	10.5
Interior décor of building	0.839		
Appearance and attire of staff	0.708		
Pleasant bank atmosphere	0.556		
Friendliness of bank personnel	0.545		
Class of people who patronized the bank	0.483		
Factor 2 – People influences			
Recommendations of friends	0.851	2.595	9.17
Recommendations of relatives	0.847		
Influence of parents	0.612		
Influence of lecturers	0.564		
Reception at the bank	0.483		
Factor 3 – Service provision			
Regular bank statement	0.814	1.994	7.57
Professionalism of bank staff	0.712		
Appropriate range of service offered	0.698		
Variety of service offered	0.427		
Factor 4 – Branch location			
Convenient branch locations	0.795	1.895	6.32
Several branches	0.790		
Convenient location of the main branch	0.596		
Factor 5 – Secure feeling			
Financial stability of the bank	0.760	1.564	5.84
Confidentiality	0.733		
Factor 6 – Marketing promotion			
Free gifts for customers	0.801	1.523	5.79
Influential marketing campaign	0.700		
Factor 7 – ATM service			
Availability of ATM in several locations	0.748	1.328	5.72
24 hours availability of ATM service	0.686		
Convenient ATM locations	0.636		
Factor 8 – Proximity			
Proximity to university	0.846	1.228	5.63
Proximity to home	0.841		
Factor 9 – Financial benefits			
Low service charges	0.806	1.067	5.3
Low interest rates on loans	0.756		

Table 3. Reliability analysis

Factor	# Item	Cronbach's Alpha
Attractiveness	6	0.796
People influences	5	0.733
Service provision	4	0.712
Branch location	3	0.642
Secure feeling	2	0.583
Marketing promotion	2	0.592
ATM service	3	0.509
Proximity	2	0.714
Financial benefits	2	0.526

Table 4. Ranking importance of bank selection factors of single and multiple bank users

Factor	Single (n = 52)			Multiple (n = 229)		
	Mean	S.D.	Rank	Mean	S.D.	Rank
Secure feeling	4.558	.6907	1	4.729	.5053	1
ATM service	4.532	.4772	2	4.699	.4018	2
Service provision	4.269	.5876	3	4.270	.5698	6
Proximity	4.212	.8708	4	4.280	.7363	4
Financial benefits	4.096	.8286	5	4.423	.7068	3
Branch location	4.077	.5664	6	4.273	.6127	5
Marketing promotion	3.577	.9309	7	3.646	.8241	7
Attractiveness	3.311	.7832	8	3.564	.6223	8
People influences	3.039	.6694	9	2.924	.6594	9

Based on a five-point Likert scale 1 = not important at all; 5 = very important

Table 5. Bank selection factors – a comparison between single and multiple bank users

Bank Selection Factors	Mean	S.D.	t-statistic	Sig.
Attractiveness				
Single	3.311	0.783	–2.180	0.033**
Multiple	3.564	0.659		
People influences				
Single	3.039	0.669	1.128	0.26
Multiple	2.924	0.659		
Service provision				
Single	4.269	0.588	–0.005	0.996
Multiple	4.270	0.570		
Branch location				
Single	4.077	0.566	–2.111	0.036**
Multiple	4.273	0.613		
Secure feeling				
Single	4.558	0.691	–1.691	0.096*
Multiple	4.729	0.505		
Marketing promotion				
Single	3.577	0.931	–0.535	0.593
Multiple	3.646	0.824		
ATM Service				
Single	4.532	0.477	–2.338	0.022**
Multiple	4.699	0.402		
Proximity				
Single	4.212	0.871	–0.580	0.562
Multiple	4.280	0.736		
Financial benefits				
Single	4.096	0.829	–2.636	0.010***
Multiple	4.423	0.707		

Notes: * Significant at $p < 0.1$; ** significant at $p < 0.05$; *** significant at $p < 0.01$

Table 6. Characteristics of single and multiple bank users

	Single (n =52)		Multiple (n = 229)		χ^2
	n	Percentage	n	Percentage	
Gender					
Male	16	14.3	96	85.7	2.199
Female	48	17.7	223	82.3	(p = .091)
Race					
Malay	46	19.7	187	80.3	1.384
Non-Malay	6	12.5	42	87.5	(p = .166)
Course					
Science	23	20.2	91	79.8	0.355
Non-Science	29	17.4	138	82.6	(p = .329)

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The Effects of Merger and Acquisition Announcements on the Security Prices of Bidding Firms and Target Firms in Asia

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Abstract

With the rise of the Asian financial crisis in 1997 and the smash of IT bubbles in 2000, there has been an increase in the number of corporate takeovers and mergers. In light of these events, we investigate the effects of acquisition announcements on the pricing behavior of the Asian bidding and target firms using the data of mergers or acquisitions announcements from the Bloomberg Database and Reuters Business Database fpr Hong Kong, China, Taiwan, Singapore, South Korea and Japan over the period from 1 January 2000 to 31 December 2007. Our result indicates that information concerning a forthcoming corporate takeover is considered good news for the shareholders of bidding firms but not regarded as good news for the shareholders of the target firms. In addition, we confirm the hypothesis that the abnormal return for the shareholders of bidding firms during the post-announcement period depends on the type of acquisition.

Keywords: Mergers, Acquisitions, Announcement effect, China, Japan, Taiwan, Korea, Singapore, Hong Kong

1. Introduction

Merger and acquisitions (M&A) activities have been a common form, staple transaction activity for more than four decades in North American and European markets before reaching its mature stage in the 1990s. In Asia, most of the M&A activities have taken place only after the Asian financial crisis in 1997. M&A activities have not only captured the interest and attention of a broad segment of the community but have also attracted the scrutiny of governments in Asian economies. The reasons are that: first, most of the Asian governments encouraged the M&A of companies so as to raise competitiveness and to reduce cost. Economic power would be concentrated to a few multinational enterprises (MNCs) due to M&A activities. Secondly, as the Asian stock markets become more developed, shareholders' knowledge about the market has improved substantially. Small investors are often in a dilemma when they are forced to decide whether or not to sell their shares in facing of a bid as they do not have the knowledge about the gain-loss circumstances of the M&A game. By the same token, managers of a target company might not know if there exists any gain when they face a bid. Most of the time, it is the preferences of bidding firm managers and target firm managers who have the controlling rights that determine the form of payment in an acquisition. (see Ghosh and Ruland (1998)). [1] In general, risk reduction and value acquisition are the main reasons for bidding firms to launch takeovers.

So far, most studies about the effects of M&A announcements focus on North American and European markets, there were few studies on M&As and their resulting abnormal returns in Asian markets. The objectives of this study are to examine empirically whether M&A activitiy creates abnormal returns to shareholders of companies concerned around the M&A announcement period in Asian markets, including Hong Kong, China, Taiwan, Singapore, South Korea and Japan, over the period from 1 January 2000, to 31 December 2007. Our result indicates that information concerning a forthcoming corporate takeover is considered good news for the shareholders of bidding firms but not regarded as good news for the shareholders of the target firms. In addition, we confirm the hypothesis that the abnormal return for both the shareholders of bidding firms and target firms at the announcement period do not depend on the type of acquisition, form of target firms or mode of payment.

The study is organized as follows. Section 2 reviews the literature and hypotheses. Section 3 shows the methodology and section 4 describes the data. Section 5 presents the estimated results. Conclusion are presented in section 6.

2. Literature Review and Hypotheses

There are a number of studies about the effects of M&A announcements. Dodd and Ruback (1977) analyzed abnormal returns around the time of a takeover announcement and found that both the target and bidding firms' shareholders earned

positive and significant gains from a successful takeover. Langetieg (1978) measured shareholder gains from the mergers and found an insignificant post-merger excess returns. Asquith and Kim (1982) examined returns to stock holders of target firms around the date of the initial announcement or completion of a merger. They concluded that the stockholders of target firms gained, while those of bidding firms did not. Jensen and Ruback (1983) reviewed 13 studies on the abnormal returns around takeover announcements. They found that the average excess returns to target firms' stockholders are of 30% and 20% for the successful tender offers and mergers, respectively; while bidding firms' stockholders gained an average of 4% around tender offers but no abnormal return around the merger. Frank et al. (1991), however, found no evidence to support significant abnormal returns of acquiring firms over a three-year period after the bid date. Agrawal et al. (1992) concluded that bidding firms lost from the acquisitions over several years but Ruback (1977), Kummer and Hoffmeister (1978) and Dodd (1980) indicated that bidding firms gained from the acquisitions.

Travlos and Papaioannou (1991) examined the impacts of method of payment on bidding firms' stock return at the initial announcement of takeover bids. They found that the abnormal return of bidding firms on the announcement day were -1.3% for stock exchange and -0.8% for cash offers. Suk and Sung (1997) looked at the effects of method of payment, form of acquisition and type of offer on target firms' abnormal returns around the takeover announcement. They showed that there was no difference in premiums between a stock offers and a cash offers. Chang (1998) examined bidder returns at the announcement of a takeover proposal when target firms were privately held. He indicated that bidders experienced no abnormal return in cash offers but a positive abnormal return in stock offers. The monitoring activities and information asymmetries were reasons for a positive wealth effect. Knapp (2006) concluded that post-merger abnormal return of bank related companies was significantly larger as compared with the industry mean in the first 5 years after a merger. Recently, Al-Sharkas et al (2008) showed that mergers could improve the cost and profit efficiencies of banks and provided an economic rational for future mergers in the banking industry.

Who gained and who lost in the M&A game? The results are somewhat mixed. The objective of this study is to test if the firms concerned in Asia experience abnormal returns around M&A announcement periods (no matter if the M&A activities were completed or not), thus we propose the following hypotheses:

Hypothesis 1. The average abnormal returns (AAR) across all securities for any individual time period t in the event period are positive.

Hypothesis 2. The cumulative average abnormal returns (CAAR) across all securities for any individual time period t in the event period are positive.

Hypothesis 3. The cumulative abnormal returns (CAR) of the bidding firms for any individual time period t surrounding the announcement period depends on the type of acquisitions, the mode of payment and the form of target firms.

We hope that the results will provide important implications to all those involved in the M&A game in Asia.

3. Methodology

*3.1 Market Mode*l

The market model which is one of the benchmarks in measuring abnormal returns[2] with daily data is employed, with adjustments of daily closing prices for stock dividends and splits. The market model which indicates a linear relationship between security returns and returns on a market portfolio is given below:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \mu_{jt} \quad (1)$$

where

R_{jt} = the daily rate of return on security j on day t,

R_{mt} = the daily rate of return on market index on day t.

β_j = a covariance between R_{jt} and R_{mt} divided by a variance of R_{mt}.

i.e., covariance (R_{jt}, R_{mt}) / Var (R_{mt})

α_j = expected value of ($R_j - \beta_j R_m$), and

μ_{jt} = model error term of security j on day t, with expected value equal to zero.

The daily closing rates of return are calculated by:

$$R_{it} = [(P_t - P_{t-1} + D_{it}) / P_{t-1}] \times 100\% \quad (2)$$

where

R_{it} = the rate of return on security i on day t,

P_{it} = the closing price on security i on day t,

P_{it-1} = the closing price on security i on day t-1 and

D_{it} = the cash dividend on security i on the ex-dividend day concerned

The daily closing rates of market indices are calculated by:

$$R_{mt} = [(P_{mt} - P_{mt-1}) / P_{mt-1}] \text{ X } 100\% \quad (3)$$

where

R_{mt} = the rate of return on the market index on day t,

P_{mt} = the closing market index on day t and,

P_{mt-1} = the closing market index on day t-1.

In order to capture the abnormal returns, it is necessary to determine the expected normal return in the observation period. A set of observation periods and event periods are initially established. From this initially established set, we observe whether or not abnormality happens in various sub-periods. Correspondingly, the data from any sub-periods exhibiting abnormality are analyzed.

We followed the methodology used by Huang and Walkling (1987) that a maximum of 351 daily return observations are used for the period around the event at time t, starting at day t -300 and ending at day t +50. The estimation period is, thus, from trading day t -300 through trading day t-51, where t is an initial date of acquisition announcement. The following 101 days (-50 through +50) is designated as the event period. The pre-announcement period is from day -50 to day -2. The announcement period is from day -1 to day 0. The post-announcement period is from day +1 to day +50. The following diagram illustrates those periods in detail.

(Insert Figure 1 here)

Abnormal returns are computed as the difference between actual returns and estimated expected returns:

$$AR_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt}) \quad (4)$$

where R_{jt} is the daily rate of return on security j over day t, $\hat{\alpha}_j$ and $\hat{\beta}_j$ are estimated parameters α_j *and* β_j. AR_{jt} is the estimated abnormal return for security *j* over day t and t is the t^{th} day of the analysis period, measured in relation to the initial acquisition announcement date.

The average abnormal return (AAR) across all securities for any individual time period t in the estimation period is obtained by aggregating all abnormal returns of firms (with return data) on day t divided by N (the number of firms with return data on day t):

$$AAR_t = 1/N_t \sum_{j=1}^{N_t} AR_{jt} \quad (5)$$

In order to examine the cumulative effect of events, the cumulative average abnormal returns (CAAR) are produced.

$$CAAR_{(T1,T2)} = \sum_{t=T1}^{T2} AAR_t \quad (6)$$

where T1 is the first day of an event period in which the AAR_t are accumulated and T2 is the last day of an event period in which the AAR_t are accumulated.

Finally, to test if each individual period's abnormal return AAR_t is significant in the event period, the test statistic, ϕ, is obtained by dividing AAR_t by the estimated standard deviation.

$$\text{i.e.} \quad \phi = AAR_t / SE \quad (7)$$

where SE is the standard deviation of average abnormal returns of each security during the estimation period and is estimated by[3]:

$$SE = \sum_{t=T1}^{T2} [(AAR_t - \overline{AAR})^2 / (T-1)]^{1/2} \quad (8)$$

where T is the number of days in the observation period, T1 and T2 are the first and last day in the estimation period. AAR_t is average abnormal returns across all securities for any individual time period t in the estimation period and $\overline{AAR}$ is the average abnormal return across all the securities during the estimation period and is calculated by:

$$\overline{AAR} = 1/N \sum_{t=T1}^{T2} AAR_t \quad (9)$$

Thus we test Hypothesis 1: H_0: $AAR_t = 0$

$$H_1: AAR_t \neq 0$$

where AAR_t is average abnormal returns across all securities for any individual time period t in the event period.

In order to test the significance of cumulative average abnormal return (CAAR) over a certain period, the test statistic, ϕ_C, for CAAR is used:

$$\phi_C = CAAR /[SE(n)^{1/2}] \quad \text{(10)}$$

n is the number of trading days from starting to ending over which the average abnormal return is calculated. (where n can be as little as two days or as large as the entire event period.)

thus we have Hypothesis 2: $H_0: CAAR_{y1y2} = 0$

$$H_1: CAAR_{y1y2} \neq 0$$

where y_1 is the first day of the pre-announcement period, the announcement period or the post-announcement period and y_2 is the last day of the corresponding period in which the cumulative average abnormal return is calculated.

3.2 Regression Model

The following model is used to test if the type of acquisition, the type of target firm and the mode of payment would affect the CAR of bidding firms. We used the dummy variables for the type of acquisition, the type of target firm and the mode of payment and the market size of bidding firms. In addition, the relative size of the market value of the target to bidder and the market size of bidding firms are included as the control variables.

$$CAR_{y1y2} = \alpha_0 + \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 RMZ + \beta_5 M + \mu_i \quad \text{(11)}$$

where:

CAR_{y1y2} = cumulative abnormal return from day y_1 to day y_2[4]

$D_1 = 1$ if the type is acquisition

$D_1 = 0$ otherwise

$D_2 = 1$ if target firm is private

$D_2 = 0$ otherwise

$D_3 = 1$ if mode of payment is cash

$D_3 = 0$ otherwise

RMZ = relative size of the market value of the target to bidder (in US$) at announcement date

M = market size of bidding firms (in US$) at announcement date

(which is calculated by the product of number of outstanding share and closing price at announcement date)

μ_i = error terms

The test of hypothesis 3 is equivalent to the test of:

H_3: $\beta_1 = 0$ (acquisitions vs. mergers)

H_4: $\beta_2 = 0$ (public target firms vs. private target firms)

H_5: $\beta_3 = 0$ (cash offer vs. share offer)

4. Data Description

This study covers all M&A deals with public firms in China, Japan, Hong Kong, Singapore, South Korea and Taiwan during the 1990s, irrespective of whether they are successful or not. These economies are chosen because they are major economic centers in Asia with well- developed stock markets. The sample covers all the merger or acquisition announcements rather than lists of completed acquisitions so as to decrease the ex-post selection and classification bias. Information on merger or acquisition announcements over the period from 1 January 2000 to 31 December 2007 are contained from the Bloomberg and Reuter Business Database, including Hong Kong, China, Taiwan, Singapore, South Korea and Japan. There are 95 mergers and 563 acquisitions for the overall sample in which 203 public (target) firms and 455 private (target) firms are involved. Cash is the major payment method in the entire sample. The announcement must be the first notice to the public. If a stock has more than ten missing returns in the estimation period, or any missing return in the event period, it is eliminated from the sample. We divided the sample into six subsets according to their listing location. Announcements are classified by type of acquisition (merger or acquisition) and form of target firms (private or public companies) and mode of payment (cash or share) in our study.

With cases in Hong Kong, the daily closing rates of return for securities and market indices of the Hong Kong Stock Exchange are used. Hong Kong Hang Seng Index is used as a proxy for the market returns for securities listed on the Stock Exchange of Hong Kong. In China, the daily closing rates of return for securities and market indices of the

Shanghai Stock Exchange are used. In Taiwan, the daily closing rates of return for securities and market indices of the Taiwan Stock Exchange are used. Taiwan Stock Exchange Weighted Average Index is used as a proxy for the market returns. In Japan, the daily closing rates of return for securities and market indices of Japan Stock Exchange are used. The Nikkei Average 500 Index is used as a proxy for the market returns. In Singapore, the daily closing rates of return for securities and market indices of Singapore Stock Exchange are used. Singapore Stock Exchange All Share (SGP) Index is used as a proxy for the market returns. In South Korea, the daily closing rates of return for securities and market indices of South Korea Stock Exchange are used. The KOSPI Composite Index is used as a proxy for the market returns.

5. Estimated Result

5.1 Abnormal Returns on Bidding Firms

During the study period from January 2000 to Dec 2007, there are 95 mergers and 563 acquisitions for the overall sample in which 203 public (target) firms and 455 private (target) firms are involved. Table 1 shows the number of M&A announcements over study the period. Most of the M&A activities are in the Japan, Singapore and Hong Kong during the study period. Cash is the major payment method of M&A transaction; about 90% of acquisitions are pure cash transactions in the entire sample.

(Insert Table 1 here)

Cumulative average abnormal return (CAAR) on bidding firms and on target firms for the various announcement period is summarized in Table 2. During the pre-announcement period, majority of bidding firms have positive CAAR: the Japanese bidders scoring the highest CAAR of 8.2%, followed by Singaporean (6.9%), Hong Kong's (4.5%), Taiwanese (4.7%), Chinese (-3.3%) and South Korean (-6.18%). The CAAR of Hong Kong, Taiwan, Singapore and Japan are statistically significant at 5% level or above. For all bidding firms as a whole, the CAAR is positive (2.72%) and statistically significant at 10% significant level. Most bidding firms in various economies enjoy a positive CAAR because stock investors overestimate the bidding firms on the future efficiency of the target firms on the merge. Hence, they are more willing to hold more stocks. As more information release in stock markets such as financial information of firms involved in the M&A and the terms and conditions of merger proposals, some stock investors change their minds. Japan is the economy with the most bidding firms (70%) that earns positive CAAR during the pre-announcement period.

For the announcement period (day -1 to 0), only Singapore and Japanese bidding firms enjoy a positive CAAR of 0.5% and 0.25% respectively. The CAAR for other bidding firms is negative and statistically insignificant. This reflects that announcement effect of M&A to market is not strong enough to influence stock prices during the announcement period as stock investors may hold difference views on the merge. Some of them are optimistic, some are pessimistic and some are waiting for further information before taking any action. Different responses to the M&A announcement would cancel out each other. Singapore is the economy with the most bidding firms (62%) that earns positive CAAR during the announcement period.

At the post-announcement period (day 1 to 50), South Korea obtains the highest CAAR of 43%, followed by Chinese (11%), Singaporean (8%), Taiwanese (5%) and Japanese (4%). All estimated CAAR are statistically significant except China. China is the economy with the most bidding firms (67%) that earns positive CAAR during the post-announcement period. It is due to the fact that most companies in China which become a target are facing mounting loans and their asset values have depreciated subsequent to the Asia Financial Crisis and the break of IT bubbles. Therefore, it is favorable to the bidding firms to acquire them. If M&A activities are successful and bidding firms improve the target firms' performance, it is profitable for both the bidding firms and the target firms. Compared with the pre-announcement period and announcement period, the CAAR to all bidders is 9.2% during this period and is statistically significant at one percent level. The result reflects that M&A announcements create positive effect to most enterprises in Asian economies during the post-announcement period.

(Insert Table 2 here)

However, the CAAR to target firms for the above three periods is -2.5%, -0.24%, and -5.2%, respectively, and are statistically insignificant. The CAAR drops due to the fact that investors and speculators overbuy the target stocks at the first place and the performance of target firms does not match the market expectations. Investors sell their stocks, which results in stock prices of target firms dropping dramatically in the post-announcement period. In addition, speculators buy the stock of target firms in advance of the announcement on an expectation that the stock prices will rise due to M&A announcement. However, some M&A attempts would fail to complete, so profit-making investors and speculators sell their shares of target firms.

5.2 Factors Affecting Cumulative Average Abnormal Return (CAAR)

The distribution of CAAR of bidding firms by countries during the announcement period is displayed in Table 3.

In Hong Kong, the CAAR for acquisitions is -0.4% and that for mergers is -0.03%. The CAAR for cash offers on

average is -0.39% and that for stock offers is -0.04%. Offers involved in public firms have abnormal return averaging -0.03% but that for private firms is -0.4%.

In Taiwan, bidding firms enjoy a -0.65% and –0.04% of CAAR for acquisitions and mergers respectively, while that CAAR for cash and stock offers on average is -0.67% and 0.2%. Offers involving public firms have abnormal return averaging -0.55% but those involving private firms are -0.14%.

In China, the CAAR for acquisitions is -0.8% and the CAAR for mergers is -0.24%. Residuals for both cash offers and stock offers, on average, are -0.52%. Offers involving public firms have abnormal return averaging 0.2% but those involving private firms are -0.3%.

In Singapore, the CAAR for acquisitions, is 0.61% and the CAAR for mergers is 0.03%. The residual for cash offers on average is 0.61% and the residual for stock offers is 0.03%. Offers involving public firms have abnormal return averaging 0.1% but those involving private firms are 0.55%.

In Japan, the CAAR for acquisitions is 0.18% and the CAAR for mergers is -0.06%. The residual for cash offers on average is 0.02% and the residual for stock offers is 0.2%. Offers involving public firms have abnormal returns averaging 0.05% but those involving private firms are 0.19%.

In South Korea, the CAAR for acquisitions is -0.98% and the CAAR for mergers is -0.4%. The residual for cash offers on average is –1.16% and the residual for stock offers is 0.2%. Offers involving public firms have abnormal return averaging -0.24% but those involving private firms are -0.96%.

(Insert Table 3 here)

To sum up, these results show that different types of acquisitions, modes of payment and types of target firms cause different results of CAAR to shareholders of bidding firms.

For target firms, the CAAR of acquisitions and mergers are displayed in the Table 4. The CAAR of target firms for acquisitions is -0.25% and that for mergers is -0.03%. The residual for cash offers on average is –0.26% and the residual for stock offers is 0.3%.

(Insert Table 4 here)

5.3 Regression Results

Table 5 reports the estimated results of equation (11) for various time periods for the cumulative abnormal return (CAR) of bidding firms as a function of types of acquisition, types of target firms and forms of payment[5]. From regression A, we find that none of the coefficients of the dummy variables is statistically significant at a 10 percent significance level. This implies that the type of acquisitions, type of target firms and mode of payment, do not affect the CAR of bidding firms during the pre-announcement period. We find similar results for regressions B. This implies that the type of acquisitions, type of target firms and mode of payment do not affect the CAR of bidding firms during announcement period as well. We combine both the pre-announcement period and announcement period together and the result does not change much. We thus can conclude that the type of acquisitions, type of target firms and mode of payment do not affect the CAR of the bidding firms during pre-announcement period and announcement period.

(Insert Table 5 here)

The coefficient of $\widehat{\beta}_1$ is statistically significant at a one percent level in regression C. This indicates that the CAR of bidding firms is affected by the type of acquisition at post-announcement period. A similar result is found in regression E for the period between announcement and post-announcement. We, thus, can assert that the type of acquisition would affect the consequence of CAR of bidding firms during announcement period and post-announcement period.

6. Conclusion

This paper examines whether firms involved in M&A activities experience abnormal return around M&A announcement periods and tests if abnormal return on the stock holdings of these firms would be affected by the types of acquisition, the modes of payment or the types of target firms by using the data from six Asian key markets. We find that there exists significantly negative average residuals for target firms around the M&A announcement period. This indicates that market reaction of target firms to takeovers in Asia is negative. Thus we can conclude that the terms and conditions of the takeovers are not in favor to the shareholders of target firms. They are grieved to have the deals. At the same time, the unusual price reactions in the form of CAAR for target firms during the pre-announcement period (-2.5%), the announcement period (-2.4%) and the post-announcement period (-5.2%) are negative but not statistically significant. Thus, there is no abnormal return on target firms at the time surrounding the announcement period.

By contrast, we find that the CAAR facing shareholders of bidding firms is positive at the post-announcement period. This indicates that the information concerning a forthcoming corporate takeover is not considered as good news for shareholders of target firms, as opposed to that of bidding firms. This might be due to the poor performance of target firms before a takeover announcement. Further study is aspired to judge this argument. The changes in share prices

prior to the announcement or after announcement might be due to the information leakage to the markets, profit performance of firms involved, or acquiring prices which may be different from market expectation. Evidence on the significantly positive changes of abnormal return suggests that the shareholders of bidding firms support M&A deals as they expect future efficiency of the merger and thus gain from the M&A activity.

One limitation of our study is that the study period is not long enough, so the merger effect, if any, on target and bidding firms is not apparent. From 2000 to 2007, Asian countries faced the the break of IT bubbles and prices of most stocks flunctated devastatingly. Most of sample countries selected are open to international markets and upon a global economic enviroment, so most of the listed firms in these countries face a considerable fall in their stock price. Hence, the result might be affected by the financial crisis. One thing, that is certain, is the financial crisis causing a series of M&A activities. Some companies aim to enjoy synergy gain or others aim at saving their subsidiaries that were trapped in the financial crisis. In general, there is a lack of regulation about M&A activities in Asian countries, but the investigation of regulations about M&A activities is not the objective of the study. In particular, the determinant of factors that affect abnormal returns of bidding firms and target firms around the announcement period is a topic that deserves future research.

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Notes

Note 1 Ghosh and Ruland (1998) found that managers of target firms were more likely to choose stock offer rather than cash in order to keep their jobs in combined firms.

Note 2. The market model is used because it is better than other benchmarks such as mean adjusted return model and market adjusted return model in measuring abnormal return with daily data (see Brown and Warner (1985), Dodd and Ruback (1977) and Dodd (1980)).

Note 3. see Brown and Warner 1985.

Note 4. y_1 is the first day of the pre-announcement period, announcement period or post-announcement period and y_2 is the last day of the pre-announcement period, announcement period or post-announcement period

Note 5. The estimation of the CAR of the target firms will be skipped because in our sample, it happens that all target firms are public firms and all M&A activities are of cash offers

Table 1. M&A announcements in Asian markets for the period 2000-2007

	Hong Kong	China	Taiwan	Singapore	Japan	South Korea	Total.	%
2000	12	1	35	46	27	10	131	20%
2001	40	6	33	40	9	6	134	20%
2002	35	8	2	32	20	13	110	17%
2003	18	2	0	22	61	3	106	16%
2004	13	1	0	5	14	0	33	5%
2005	23	10	5	8	20	5	71	11%
2006	4	12	4	6	10	3	39	6%
2007	5	11	5	6	5	2	34	5%
Total	150	51	84	165	166	42		
						Total:	658	100%

Source: Bloomberg and Reuter Business Database

Table 2. Summary of CAAR and t-statistics of bidding firms and target firms involved in M&A activity.

	Bidding firms							Target firms
	Hong Kong	China	Taiwan	Singapore	Japan	South Korea	All firms	All firms
***Panel A: Pre-announcement period* (day-50 to –2)**								
CAAR	4.5%	-3.3%	4.7%	6.9%	8.2%	-6.18%	2.72%	-2.5%
T- statistics	2.65***	-0.14	1.98**	4.31***	3.11***	-0.71	1.67	-0.97
% of firms with positive CAAR	49%	46%	41%	59%	70%	63%	52%	N.A.
***Panel B: Announcement period* day-1 to 0)**								
CAAR	-0.33%	-1.5%	-0.55%	0.5%	0.25%	-1.13%	-0.38%	-0.24%
T- statistics	-1.36	-1.57	-1.81*	2.32***	0.89	-1.35	-1.52	-0.89
% of firms with positive CAAR	39%	61%	42%	62%	59%	51%	52%	N.A.
***Panel C: Post-announcement period* (day1 to 50)**								
CAAR	-11%	11%	5%	8%	4%	43%	9.2%	-5.2%
T-statistics	-2.3***	0.22	2.55***	2.11***	2.19***	2.12***	2.12***	-1.56
% of firms with positive CAAR	29%	67%	38%	48%	41%	38%	42%	23%

Notes: Calculated by the authors

***, ** and * denote statistical significance in 2-tailed test at 1%, 5% and 10% levels respectively.

N.A. is for "not available"

Table 3. Distributions of CAAR of bidding firms by type of acquisition, mode of payment and type of target firm by country.

Country	Type	Number of firms	Cumulative average abnormal return
Hong Kong			
Type of acquisition	Acquisition	137	-0.4%
	Merger	13	-0.3%
Mode of payment method	Cash	130	-0.39%
	Stock	20	-0.04%
Type of target firm	Public target firm	16	-0.03%
	Private target firm	134	-0.4%
Taiwan			
Type of acquisition	Acquisition	75	-0.65%
	Merger	9	-0.05%
Mode of payment method	Cash	82	-0.67%
	Stock	2	0.2%
Type of target firm	Public target firm	67	-0.55%
	Private target firm	17	-0.14%
China			
Type of acquisition	Acquisition	45	-0.8%
	Merger	6	-0.24%
Mode of payment method	Cash	31	-0.52%
	Stock	20	-0.52%
Type of target firm	Public target firm	1	0.2%
	Private target firm	50	-0.3%
Singapore			
Type of acquisition	Acquisition	152	0.61%
	Merger	13	0.03%
Mode of payment method	Cash	135	0.61%
	Stock	30	0.03%
Type of target firm	Public target firm	50	0.1%
	Private target firm	115	0.55%
Japan			
Type of acquisition	Acquisition	128	0.18%
	Merger	38	0.06%
Mode of payment method	Cash	136	0.22%
	Stock	30	0.2%
Type of target firm	Public target firm	25	0.1%
	Private target firm	141	0.19%
South Korea			
Type of acquisition	Acquisition	32	-0.98%
	Merger	10	-0.22%
Mode of payment method	Cash	39	-1.18%
	Stock	3	0.2%
Type of target firm	Public target firm	1	-0.24%
	Private target firm	41	-0.96%

Source: Bloomberg and Reuter Business Database and calculated by the authors

Table 4. Distribution of CAAR of target firms by type of acquisition and mode of payment

Type of acquisition	Number of firms	Cumulative average abnormal return
Acquisition	569	-0.25%
Merger	89	-0.03%
Payment method		
Cash	553	-0.26%
Stock	105	0.12%

Source: Ibid

Table 5. Regression results of CAR of bidding firms around M&A announcements for the period between January 2000 and December 2007.

$$CAR_{y1y2} = \beta_0 + \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 M + \mu_i$$

Regression	$\widehat{\beta}_0$	$\widehat{\beta}_1$	$\widehat{\beta}_2$	$\widehat{\beta}_3$	$\widehat{\beta}_4$	Adjusted R-square	F-test
A	-0.063 (-1.29)	-0.084 (-0.62)	0.043 (0.041)	-0.005 (-0.31)	0.0002 (0.567)	0.001	0.06
B	-0.003 (- 0.169)	0.012 (1.01)	-0.010 (-1.32)	-0.003 (-0.11)	0.358 (0.52)	0.01	0.55 .
C	0.576 (1.55)	-0.752 (-3.11)***	0.091 (0.623)	0.159 (0.29)	-0.177 (-0.132)	0.014	2.68
D	0.615 (0.61)	-0.096 (-1.15)	0.030 (0.650)	-0.006 (-0.045)	0.126 (0.32)	0.003	0.59
E	-2.181 (-1.36)	2. 362 (2.18)***	-0.012 (-0.072)	-0.348 (-0.51)	-0.0002 (-0.019)	0.008	1.98

Notes:

Regression A: on the pre-announcement period

Regression B: on the announcement-period.

Regression C: on the post-announcement-period.

Regression D: on the pre-announcement plus announcement period.

Regression E: on the post-announcement plus announcement period.

$\widehat{\beta}_1$**:** estimated coefficient of Type of Acquisition

$\widehat{\beta}_2$ **:** estimated coefficient of Type of Target Firm

$\widehat{\beta}_3$ **:** estimated coefficient of Form of Payment

$\widehat{\beta}_4$ **:** estimated coefficient of Market Size of Bidding Firms

t-statistics were shown in parentheses. ***, ** and * denote statistical significance in 2-tailed test at 1%, 5% and 10% levels respectively.

Market size of bidding firms at announcement date was calculated by the product of number of outstanding share and closing price at announcement date

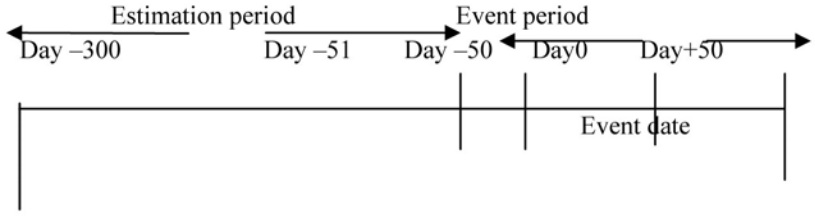

Figure 1. The time periods surrounding the announcements of M&A

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Causes, Solutions and References for the Subprime Lending Crisis

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Abstract

The subprime lending crisis and a series of relative problems have aroused wide concerns by various governments, especially by financial institutions, which have begun to suspect the easy money policy, the risk regulation of financial institution, and the rating agency. Based on the analysis of the cause of the subprime lending crisis, using foreign solutions for references, some advices were proposed in the article for China to face the financial crisis, i.e. guiding by the Basel agreement, disposing the relationship between financial innovation and risk regulation, establishing the independent currency policy frame, and recovering the market liquidity and confidence.

Keywords: Subprime lending crisis, Currency policy, Financial regulation

1. Cause of formation of US subprime lending crisis

1.1 Too easy-money policy

The current fluctuation of financial market has been induced by the global easy monetary management since the beginning of the year of 2002. Easy currency policy, increasingly progressive financial technology, continually ascending risk burden and financial lever boosted the current mess together. Especially, when the prices of various assets rise, the international credit can be gained freely by a cheap price. These too easy global credit conditions reflect the mutual function among the currency policy, the exchange rate system selected by some countries (especially by the developing countries with abundant labor forces), and the important change of the global financial system. From 2001 to 2006, industrial countries adopted the policy of low interest rate, which was proper without obvious inflation pressure. To some extent, the low inflation rate in this term reflected not only the reputations accumulated by the central bank in many years, but the advantageous influences from various active suppliers including largely increasing global effective labor force supply. For the exchange rate system, on the one hand, the easy money policy of developed countries might make the exchange rates of developed countries such as US depreciate comparing with the emerging market countries. On the other hand, in many emerging economies, the appreciation pressures of the currency were intervened by the easy currency policy and large-scale foreign exchange. The former would induce that the emerging market generated high asset price and more expenditures. The latter would further release the financial situation of industrial countries by the investments of official foreign exchange reverses in emerging markets on the sovereign debts of developed countries. Therefore, the currency stimulation would influence the credit growth in the global range. For the structured change of the global financial system, the change of regulation environment and the development of science and technology strongly supported the integration of assets securitization, globalization and financial industry, and further promoted easy credit conditions. The globalization would make the credit to be obtained freely in each concrete economy, and induce the regional problems to impact the whole world. In addition, the integration of financial industry could generate the scale economy when offering the credit, which could be transferred to borrowers by the form of easy financing conditions.

1.2 Large limitation existing in the risk prevention mechanism of financial institutions

The large limitation is mainly embodied in three aspects. First, the examination of the credit risk is ignored. After the financial institutions offer loans, they can translate loans into securities and transfer the credit risk by the asset securitization measure and the structured financial technology in the short term. In the economic ascending term, the price of house is rising, and even the borrowers can not return the loans at term, they can compensate the losses by disposing the house property. Therefore, when the financial institutions offer mortgage loans, they always think much of the credit risk not enough, and they don't strictly examine borrowers' loan repayment capacity, and they lose the basic principle of prudent management. Second, the risks are not isolated effectively. In the subprime lending crisis of US, when many financial institutions such as bank earn the incomes of agency operation by selling CDO on a commission basis, they establish the structured investment vehicles (SIV) to invest CDO specially. On the surface, the bank only offers part capitals of SIV, and most operation capitals come from the short bill financing in the market, but because of the maturity mismatching of assets and liabilities, when the market reversion happens, SIV can not obtain the market financing, the bank needs to offer capital supports, or else, SIV will go bankrupt. By this way, the risk of asset

securitization will return to the financial institutions again. Third, the "unknown risk" will bring uncertainty. In recent years, many developed structured products bound traditional asset securities with the new products based on the subprime mortgage loan, which would generate a universe uncertainty, i.e. where the risks would centralize and how is the sensitivity of the economic cycle. When the sign of bad thing happens, except for giving attention to the risks from trading opponents, the banks would more emphasize the risks of liquidity. On the one hand, they have to continually offer financing for SIV, and on the other hand, they can not turn the offered loans into securities. Here, they begin to reconsider the previous promise to offer liquidity. Under this universe atmosphere of uncertainty, except for the products with the shortest term, banks would hardly trade in the market among banks, and other markets associated with the market among banks are also been broken.

1.3 Imprudent ratings of rating agencies

In the subprime mortgage loan crisis of US, for the subprime loans which can not achieve the lowest investment class BBB, the capital manager divide these loans into the equity tranches, the mezzanine tranches, the higher tranches and the senior tranchers, and repackaging them to CDO and re-rate them again. According to the statistics, 75% CDO obtained the same rating AAA by the US government security rating agencies, and only 7% CDO were rated by BBB or lower class. In the crisis, many securities with the class AAA dropped to the class BBB. In fact, even if tiny change happens in the hypothesis of basic factors, the pertinence and the recovery rate of promise breaking will function on the rating highly sensitively. In addition, the data which were used to prove the initial hypothesis also had serious flaws, because the data could not cover all incomplete or false information in one credit cycle or short term. Many investors seemly though the rating could only reflect the credit risk and the high rating didn't indicate the possibility of the market liquidity and the drop of price. For the investors with this type of product, the potential losses of the investment combination which must be measured by the market price would far exceed the possible losses when purchases them. Because the rating agencies were not prudent in the rating process and gave higher rating to the assets with common quality, the subprime mortgage loans were worse and worse, and the crisis happened finally.

1.4 Excessively easy market admittance

Though the risk of the subprime mortgage loan is large, but financial institutions still offer subprime mortgage loans and reduce the admittance conditions of the subprime house loans because of high yield, profits and deficient risk consciousness. Some loan institutions even pushed the loan forms such as "loan without down payment" and "loan without down document", i.e. borrowers can loan capitals to purchase the house without capitals and proofs to prove their repayment abilities. The loan institutions or the loan agencies had not explain the articles about the loan and the information about the interest rate risk at large according the laws of US, so many borrowers without enough risk consciousness blindly purchased houses, which even induced many loan cheating cases happened.

2. Solutions of main countries

2.1 Nationalization of financial institutions

The Treasury Department of USA took over the Freddie and Fannie in the mess and injected capitals by the form of purchasing relative preferred stock to both of them. American Federal Reserve Committee offered emergency loans to AIG. And the government of USA began to charge the large financial assets. The government of British declared a bank rescue project with the core of nationalization, and infected capitals to various commercial banks by the form of "bank capital regulatory funds".

2.2 Reduction of interest

Seven largest central banks including China's Central Bank in the world declared the reduction of interest simultaneously. The central bank of Australia first reduced the interest in the past seven years, and the interest had achieved the lowest level since Dec of 2006. These reductions of interest were all "non-routine" reductions, because the interest reductions were not declared in the routine meeting of the central bank.

2.3 Stimulating the growth of the real economy

The president of IMF, Dominique Strau-Kahn urged that each country should use their 2% of GDP to support their own economies. APEC also promised establishing no new measures to limit the exports. EU Committee issued large economic stimulation plan to harmonize the actions of various countries to save the real economy.

2.4 Purchasing the non-performing assets of financial institutions

The US Congress had authorized the financial rescue plan with 900 billion dollars to purchase the non-performing assets of financial institutions in future two years, and enhanced the highest legal limitation of US national debt from 10600 billion dollars to 11300 billions dollars, which could leave capital space to implement the rescue plan. The Treasury Department of USA was especially authorized to purchase, hold and sell houses, commercial mortgage loans and relative loan support securities to help the financial institutions to strip their non-performing assets.

2.5 Deposit guarantee

Various governments in Europe established protective measures of individual deposit with different scales successively to guarantee the benefit of depositors. Ireland first passed the emergency act to offer 400 billion Euros of individual deposit guarantee with two years' term for 6 largest domestic banks. Various countries in European Union also adopted similar measures. The region of Taiwan promise guarantying all personal bank deposits. Singapore guaranteed all deposits including SGD and foreign currency for all individuals and enterprises.

2.6 Injecting capitals to the financial market

Various central banks frequently injected capitals to the financial market with intense liquidity. Especially after Lehman Brother went bankruptcy, the injections of various countries became more active.

2.7 Forbidding the short selling of stocks

SEC of USA issued three new regulations limiting the short-selling behaviors to guarantee the lucidity of the short-selling operation. After that, British, Australia, France, Switzerland and Ireland all forbad the short selling.

2.8 Cooperation of various countries

American Federal Reserve Committee had achieved the currency exchange agreement with the central banks of Europe, Japan, British, Switzerland and Canada to release the shortage of liquidity in the financial market. China had established the "Asian Mutual Funds" with Japan and Korea to prevent the damage of "taking money and running" to the currency system by holding the others' money as the exchange reserves.

3. References for emerging economies such as China

3.1 Seeking to establish the independent currency policy frame

In the Southeast Asian Financial Crisis, the economy of US was too hot but the economy of emerging economies was too cool, and the economy of US begins to decline at present, but the economy of emerging economies is too hot, so US should reduce the interest rate to stimulate the growth and the emerging economies should carry out the deflation policy. However, because the emerging economies lack in independent currency policy (their existing currency policy is related with the currency policy of US), so they have to absorb large surplus liquidity from US under the impact of the easy currency policy of US, which not only further stimulates the hot economy, but rise the price of the primary products. The emerging economies "imports" inflation from developed countries by the financial channels and "exports" inflation to developed countries by the trade channels, so they will suffer the inflation twice and the impacting range of the subprime lending crisis quickly spread to both parties, which also make the financial currency policies of US and emerging economies in the mess. Therefore, for the emerging economies, they must gradually get rid of the currency policy relating with dollar, and establish the independent, creditable and controllable macro economy and currency index system, for example, establishing the nominal GDP growth index to warn the inflation and adopt the deflation policies in advance.

3.2 Supporting and perfecting the new capital agreement of Basel Committee on Banking Supervision

On the one hand, evaluate the total frame of the agreement, strengthen the encouragement mechanism, and encourage the financial institutions to develop more advanced risk measurement tool to integrate the experts' adjustments for the risk discovering, limitation, reserve and capital requirements based on the capital measurement. On the other hand, ensure the capital regulatory frame to establish enough high regulatory standards for the risk transfer, enhance the capital requirements for special securitization assets, and consider the influences of the reputation risk and the potential liquidity support obligation on the capital abundance in larger range.

3.3 Properly disposing the relationship between financial innovation and risk regulation

This financial crisis discovered the excessive innovation of US financial industry, i.e. the financial innovation of US had exceeded the risk identification and control ability of the financial industry and the regulatory ability of the financial regulatory department. First, the market transparence should be further enhanced. The increasing complexity and opacity of the securitization tool induced that the risk of securitized products lacked in transparence, especially the quality of the basic assets and the potential pertinence were not clear. The process to establish the rating and the rating information should be more transparent to offer stable base for investors. Second, the encouragement mechanism should be established. This financial fluctuation indicated that many participators in the initiating-decentralizing mode weakened the encouragement to the exact risk evaluation, and the encouragements for various participators (including initiator, organizer, manager, distributor, credit rating institution and investors) are different. Therefore, it is necessary to harmonize the encouragements to all participators in the asset securitization process. Third, the cognition of the risk discovering should be enhanced. The financial fluctuation indicated that many institutions investing structured products ignored the management of the non-credit risks such as market risk, liquidity risk, centralizing risk and channel risk which were related with the securitized businesses. That means the market participators need have sufficient control

measures including effective situation analysis and pressure test program for the risk discovering. In addition, the risk discovering in the surface or the risk discovering which may be returned to the surface should be managed to avoid excessive risk centralization.

3.4 Trying to recover the market liquidity and confidence in the first time

IMF put forward three measuring standards for the crisis rescue, i.e. the targeted, the temporary and the timely. When the crisis happened early, time was life. In 1980s, one of experiences that Finland, Sweden and other north European countries disposed the bank crisis successfully was to quickly implement the rescue plan and stabilize investors' confidence to the financial market in time. For the rescue of the crisis, the market liquidity should be recovered in the first time. The method to solve the liquidity crisis is to ensure that the banks and other financial institutions can finance capitals from the central bank without limit, eliminate the panic in the financial market and recover the confidence in the market.

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